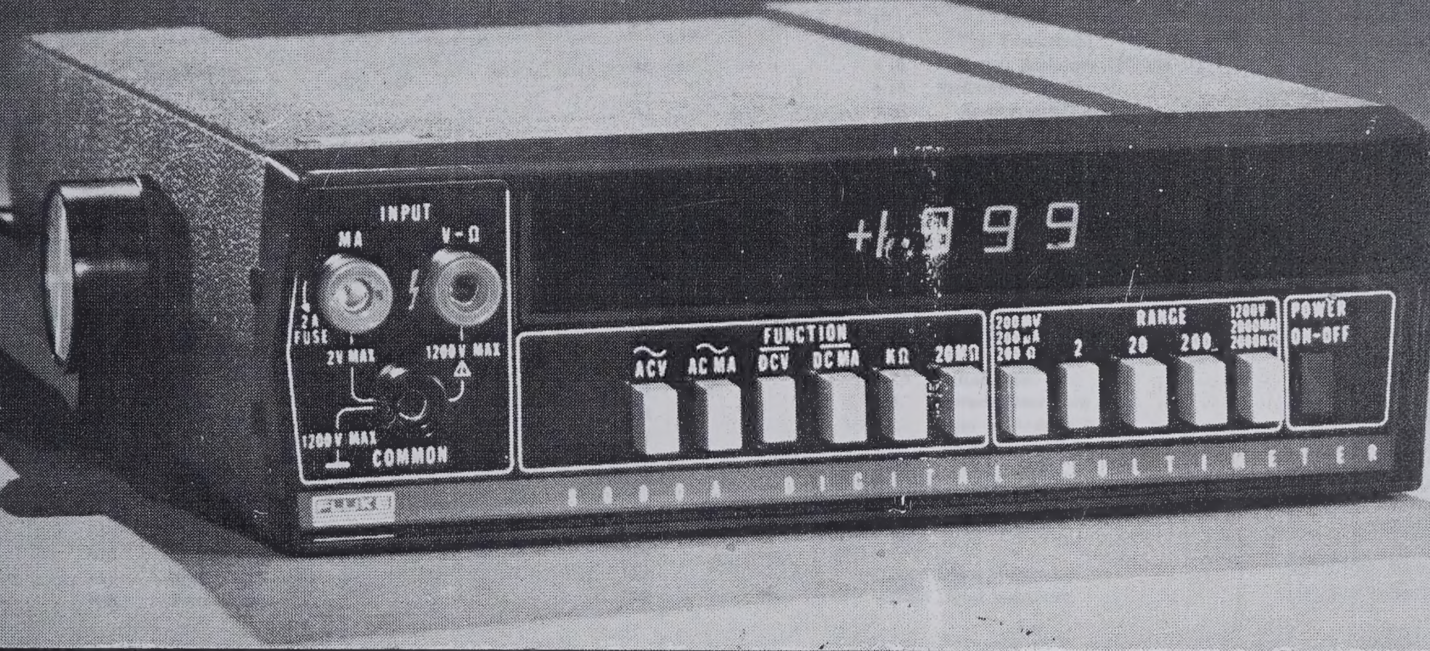
FLUKE

8000A
digital multimeter



JOHN FLUKE MFG. CO., INC. P.O. BOX 7428 SEATTLE, WASH. 98133

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SECTION 1

INTRODUCTION & SPECIFICATIONS

1-1. DESCRIPTION

1-2. The compact and light weight Model 8000A is a three and one-half digit multimeter. A unique analog-to-digital conversion technique, with inherent self zeroing, eliminates offset uncertainties. Two LSI chips comprise the analog-to-digital converter allowing a reduction of the discrete electrical component count to less than 110. Other features include automatic digital determination of polarity, continuous filtering, and LED readouts.

1-3. Pushbutton controls allow the selection of five ac and dc voltage ranges, five ac and dc current ranges, and six resistance ranges. Accurate measurement capabilities are from 100 microvolts to 1200 volts ac and dc, 100 nanoamperes to 1.999 amperes ac and dc, and 100 milliohms to 19.99 megohms.

1-4. Accessories and options are available to further increase the capabilities of the instrument. These options and accessories are listed in Table 1-1.

Table 1-1. OPTIONS AND ACCESSORIES

MODEL NO.	NAME OF UNIT
8000A	Mainframe, line powered only
8000A–01	Mainframe w/battery pack
8000A–02	Mainframe, line powered w/data output
PART NO.	ACCESSORY
C80	Carrying Case w/strap
A80	Universal Test Lead Kit
80K-30	High Voltage Probe (1kV to 30kV)
80RF	Rf Probe (100kHz to 500MHz)
80I-200	Clamp-on AC Current Probe (20A to 200A)
M00-100-714	Front Panel Dust Cover
M00-200-612	Rack Mount, Center
M00-200-611	Rack Mount, Side

DC Current

Ranges	±199.9μA, ±1.999mA, ±19.99mA, ±199.9mA, +1999mA
Accuracy: 1 year, 15° C to 35° C	±(0.3% of reading +1 digit)
Voltage Burden	0.22V maximum up to 2 Amp
Response Time	1/2 second
Maximum Input	2 Amps rms (fuse protected)

AC Current

Ranges	199.9μA, 1.999mA, 19.99mA, 199.9mA, 1999mA
Accuracy: 1 year, 15° C to 35° C	45Hz to 10kHz ±(1.0% of reading +2 digits) except 2000mA range. 45Hz to 3kHz ±(1.0% of reading +2 digits) on 2000mA
Voltage Burden	0.22V maximum up to 2 Amp
Response Time	3 seconds
Maximum Input	2 Amps rms (fuse protected)

Resistance

Ranges	199.9Ω, 1.999kΩ, 19.99kΩ, 199.9kΩ, 1999kΩ, 19.99MΩ
Accuracy: 1 year, 15° C to 35° C	200Ω, 2kΩ, 20kΩ, 200kΩ, 2000kΩ ranges ±(0.2% of reading +1 digit) 20MΩ range ±(0.5% of reading +1 digit)

Response time	200Ω, 2kΩ, 20kΩ, 200kΩ, 2000kΩ ranges: 1/2 second	
	20MΩ range: 4 seconds	
Current through Unknown	200Ω Range	1mA
	2kΩ Range	1mA
	20kΩ Range	100μA
	200kΩ Range	1μA
	2000kΩ Range	1μA
	20MΩ Range	0.1μA
⚠ Maximum Input Voltage	200Ω and 2kΩ Ranges	130V rms
	20kΩ thru 20MΩ Ranges	250V rms

Environmental

Operating Temp. Range	−10° C to +55°C
Storage Temp. Range	−40° C to +75° C (−40° C to +60° C with batteries)
Humidity Range	0 to 80% RH

General

Max. Common Mode Voltage	1200V peak
Display	7-segment LED, 0.25" character height
Size	8 - 1/2" wide x 2 - 1/2" high x 10" deep (see outlir drawing for detailed dimensions).
Weight	2 3/4 pounds (1.2Kg) without batteries 4 pounds (1.8Kg) with batteries

Power	100 - 115 - 230V ac, 50 to 400Hz, 2 watts
Battery Option (–01)	8-hour or more operation on internal rechargeable batteries.

1-6. OUTLINE DRAWING

1-7. The Model 8000A Outline Drawing is illustrated in Figure 1-1.

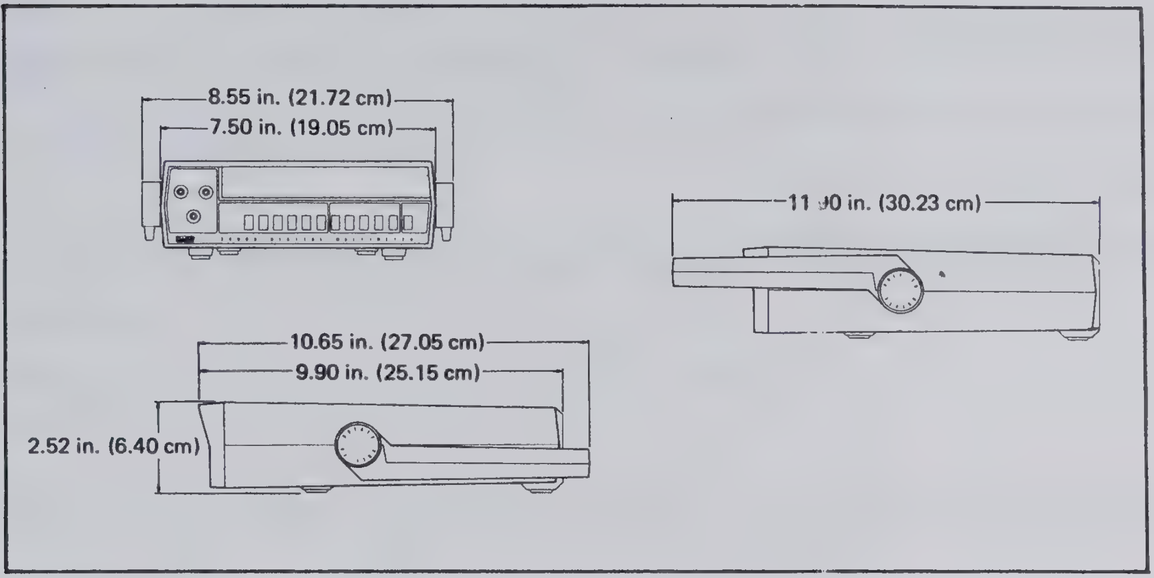


Figure 1-1. MODEL 8000A OUTLINE DRAWING.

SECTION 2

OPERATING INSTRUCTIONS

2-1. INTRODUCTION

2-2. This section contains information regarding installation and operation of the Model 8000A. The contents of this section should be read and understood before operating the digital multimeter. Should any difficulties be encountered during operation, please contact your nearest John Fluke Sales Representative or the John Fluke Mfg. Co., Inc., P. O. Box 7428, Seattle, Washington, 98133, telephone (206) 774-2211. A list of Sales Representatives is located on the inside of the rear cover.

2-3. INPUT POWER

2-4. The Model 8000A and 8000A–01 are supplied with one of three ac input power configurations. These consist of the Model 8000A/10 (100 volts, 50 to 400Hz), Model 8000A (115 volts, 50 to 400Hz), and Model 8000A/23 (230 volts, 50 to 400Hz).

2-5. Before connecting to ac line power, insure that the instrument is in the proper configuration for your power requirements. A decal on the underside of the instrument indicates which ac line voltage is required.

2-6. RACK INSTALLATION

2-7. The Model 8000A may be mounted in a standard 19 inch rack when supplied with the appropriate rack mounting kit (refer to Table 1-1). Rack mounting kits are available to allow left, right or center mounting. Instructions for installing units in the rack mount are supplied with the rack mounting kit.

2-8. OPERATING FEATURES

2-9. The location and function of all controls, connectors, and indicators is shown in Figure 2-1.

2-10. OPERATING NOTES

2-11. Spare Fuse

2-12. The MA INPUT terminal is also the fuseholder for the current protection fuse, F2. A spare fuse is located in a recess on the underside of the carrying handle.

2-13. Battery Power (Option –01)

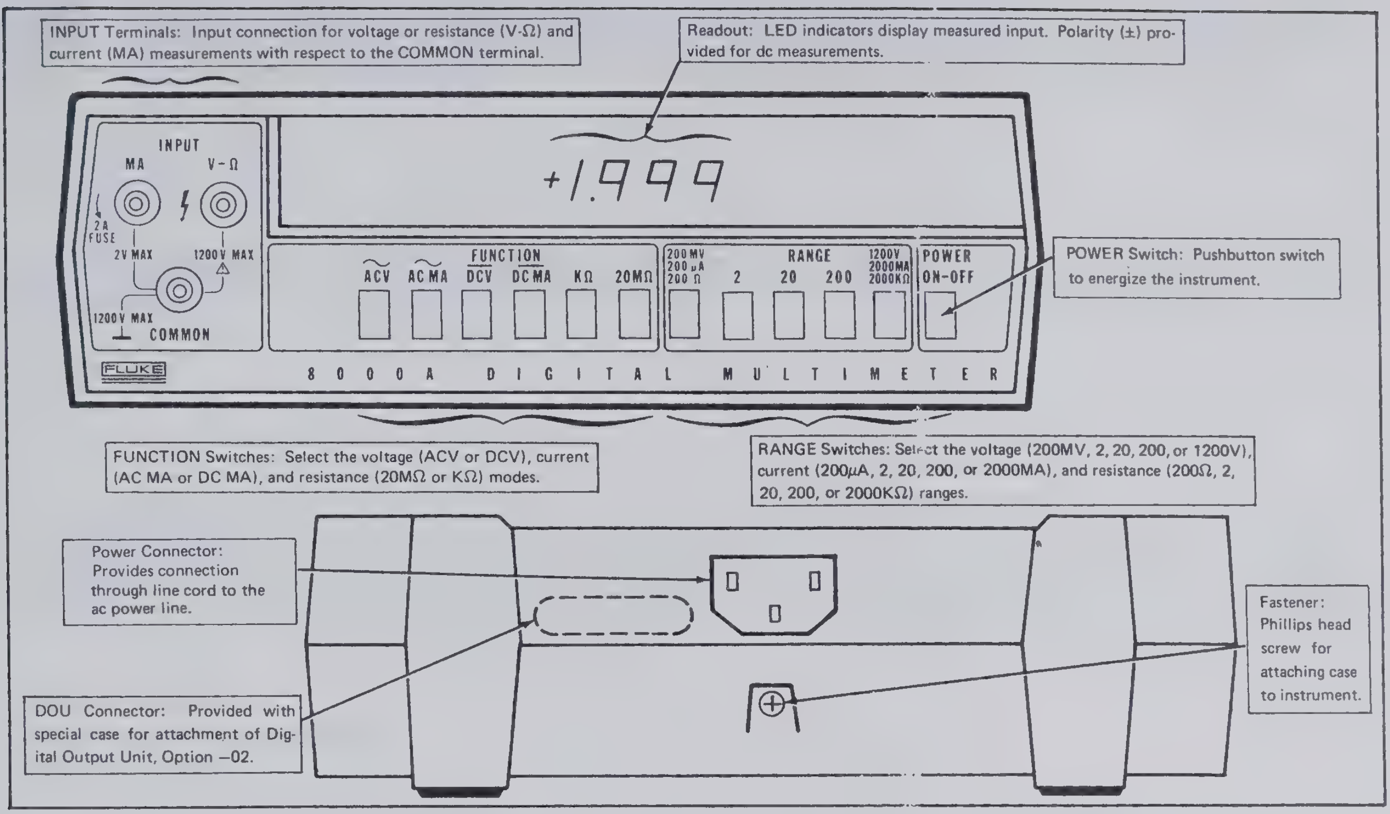


Figure 2-1. OPERATING FEATURES

2-14. Power for the Model 8000A–01 is supplied by internal rechargeable batteries that allow the instrument to operate for at least eight hours. Whenever the light quality of the display is too low to read, the batteries should be recharged. Recharging is most rapidly accomplished by switching to OFF and connecting the instrument to the ac power line. In this way, the discharged batteries can be completely charged in approximately 12 to 14 hours. The instrument can also be operated when recharging on ac power, but recharging time will be extended to approximately 56 hours.

2-15. Input Connections

2-16. Three INPUT terminals (MA, V–Ω, and COMMON) provide connection to the source or resistance under measurement. For source measurements, the MA or V–Ω and COMMON terminals connect to the respective high and low sides of the source. An unknown resistance is connected between the V–Ω and COMMON terminals.

2-17. Overload Protection ⚠

2-18. An overload condition is indicated by the simultaneous flashing of the display readouts. The dc voltage function can sustain up to 1200 volts rms between the V–Ω and COMMON terminals on any range. The ac voltage function can sustain up to 1200 volts rms (not to exceed 10^7 volt hertz) on the 20, 200, and 1200 volt ranges and 500 volts rms on the 200 millivolt and 2 volt ranges between the V–Ω and COMMON terminals. The current input is fuse protected above 2 amperes rms with a maximum of 2 volts rms between the MA and COMMON terminals. Protection for the resistance function is to 130 volts rms between the V–Ω and COMMON terminals in the 200 ohm and 2 kilohm ranges, and 250 volts rms in the 20 kilohm through 20 megohm ranges.

2-19. BASIC INSTRUMENT MEASUREMENT

2-20. Measurement instructions for the basic instrument (less Option –02 and accessories) are provided in Table 2-1.

Table 2-1. BASIC MEASUREMENT INSTRUCTIONS

MEASUREMENT	FUNCTION	RANGE	INPUT CONNECTION	REMARKS
DC Volts	DCV	200MV, 2, 20, 200, or 1200V	V–Ω and COMMON	Auto-polarity
DC Milliamperes	DC MA	200μA, 2, 20 200 or 2000MA	MA and COMMON	
AC Volts	ACV	200MV, 2, 20 200, or 1200V	V–Ω and COMMON	— —
AC Milliamperes	AC MA	200μA, 2, 20 200, or 2000MA	MA and COMMON	
Kilohms	KΩ	200Ω, 2, 20 200, or 2000KΩ	V–Ω and COMMON	
Megohms	20MΩ	Any	V–Ω and COMMON	Range switches non-functional

SECTION 3

THEORY OF OPERATION

3-1. INTRODUCTION

3-2. Information about the Model 8000A theory of operation is arranged under two major headings. One heading is titled BLOCK DIAGRAM ANALYSIS. Discussion at the block diagram level consists of the overall operation of the major circuits within the instrument. The other headings are titled CIRCUIT DESCRIPTIONS. At this level, the discussion consists of component functions within the major circuits.

3-3. Block diagrams and simplified schematics are included in this section. Schematic diagrams are located at the rear of this manual.

3-4. BLOCK DIAGRAM ANALYSIS

3-5. Introduction

3-6. Note in the block diagram, Figure 3-1, that the toned areas divide the instrument into three major sections. These sections, Signal Conditioning, Analog-to-Digital Converter, and Display, are discussed separately in the following paragraphs.

3-7. Signal Conditioning

3-8. The Signal Conditioning section provides a dc analog voltage, characteristic of the applied input, to the Analog-to-Digital Converter section. This task is accomplished by the Input Voltage Divider, Current Shunts, AC Converter, Ohms Converter, Active Filter, and associated switching.

3-9. Analog-to-Digital Converter

3-10. The Analog-to-Digital (A/D) Converter section changes the dc output voltage from the Signal Conditioning section to digital information. This is accomplished by a unique A/D conversion technique that eliminates zero error. Two LSI (Large Scale Integration) circuits comprise the A/D Converter. These circuits are the Analog Integrated Circuit and the Digital Integrated Circuit.

3-11. Display

3-12. Digital information from the A/D Converter section is decoded and visually presented by the Display section. The decoded digital information is displayed on numerical LED (Light Emitting Diode) readouts. Decoding of the digital information is accomplished by the Polarity, Decoder Driver, and Anode Control Circuits.

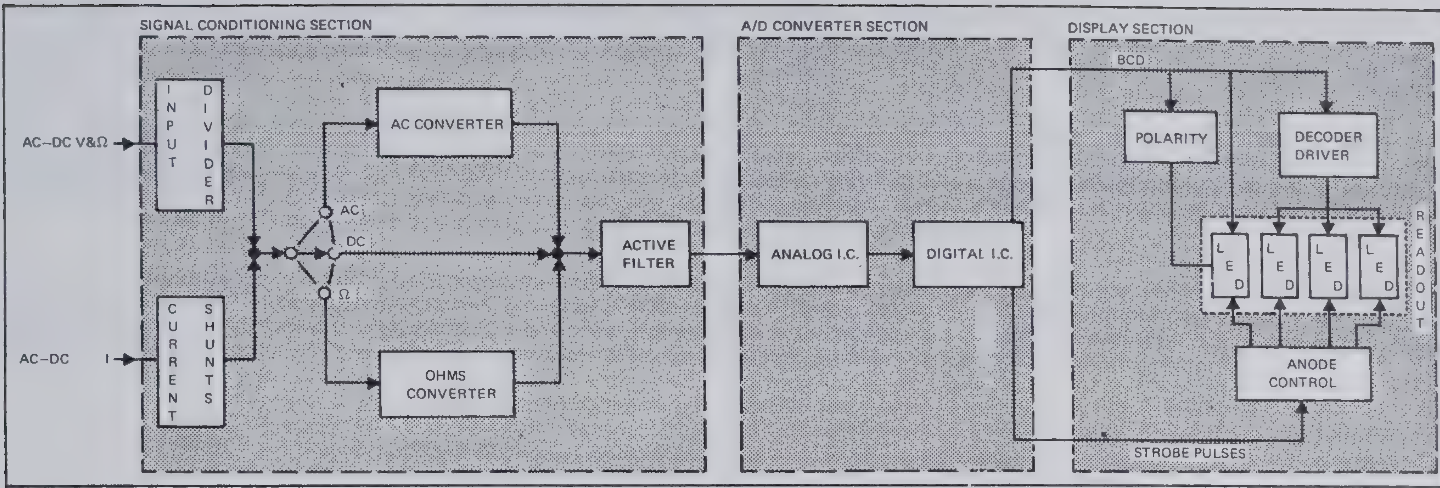


Figure 3-1. MODEL 8000A BLOCK DIAGRAM

3-13. CIRCUIT DESCRIPTIONS

3-14. Analog-to-Digital Converter

3-15. GENERAL. The A/D Converter uses a voltage to frequency conversion technique. A dc voltage at the input of the A/D Converter is changed to a frequency by the Analog Integrated Circuit. This frequency is characteristic of the magnitude and polarity of the dc input voltage. Counting of the output frequency from the Analog I.C. is accomplished by the Digital Integrated Circuit. The resultant count is transferred in BCD (Binary Coded Decimal) format to the Display section.

3-16. ANALOG I.C. The frequency output from the Analog I.C. varies ±40kHz from a rest frequency of approximately 80kHz. Input switching circuitry within the Analog I.C. (refer to Figure 3-2) alternately samples between input common and the dc voltage input at a 120 millisecond rate. During the input common sample period the output of the V/F Converter is at the rest frequency. The following input voltage sample generates an output frequency above or below the rest frequency for a respective negative or positive input voltage. Therefore the dc input voltage to the A/D Converter becomes a function of the difference of two frequencies and consequently any zero errors are eliminated.

3-17. The resistor R_{range}, in Figure 3-2, symbolizes the dual range capability of the Analog I.C. chip. This resistance, external to the chip, consists of series resistors R23, R57, R25, and R58. When the instrument is in the 2 volt basic range, all four resistors are used to scale the current to the V/F Converter. Variable resistor R25 is the calibration adjustment for this range. For operation in the 0.2 volt basic range, the switching provides a short across R25 and R58. Therefore, only resistor R57 and calibration adjustment R23 scale the current to the proper level for the V/F Converter.

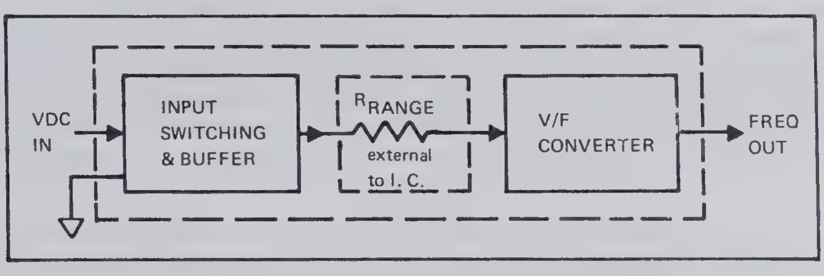


Figure 3-2. ANALOG I.C. BLOCK DIAGRAM

3-18. Timing circuitry for the A/D Converter is contained in the Analog Integrated Circuit. The connection between the Analog I.C. and the Digital I.C. is through R41, Q6, R56, and adjustment R20. Timing adjustment is accomplished by setting PERIOD adjust R20.

3-19. Overload protection for the Analog I.C. is provided by transistors Q20 and Q21. Negative overload voltages are handled by Q20 and positive overloads by Q21.

3-20. DIGITAL I.C. The output from the Analog I.C. alternates between the rest frequency during one time period and a frequency corresponding to the A/D Converter input voltage during the next period. Reversible counters in the Digital I.C. count these frequencies such that their difference is used to provide the BCD information.

3-21. A four line BCD output (W-X-Y-Z on schematic) and a four line strobing pulse output(S1-S2-S3-S4 on schematic) are provided by the Digital I.C. to the Display section. The BCD lines W-X-Y-Z correspond to binary 8-4-2-1 positions respectively.

3-22. Display

3-23. POLARITY. The polarity indicator consists of horizontal and vertical LED segments on DS1. These segments are strobed during the S1 time period, when the instrument is in the DCV or DC MA modes. The horizontal segment is used alone for a negative indication and together with the vertical segment to build a positive indication. Consequently, the horizontal segment must illuminate during each S1 time period. This is accomplished by S3D (DCV) or S4C (DCMA) which ground the cathodes of the horizontal LED segment. Illumination of the vertical segment relies upon the digital information provided by the Y BCD line during S1 time. When a positive voltage or current is applied to the INPUT terminals, the Y line goes high. This turns on Q8 and Q10 which allow the vertical segment to illuminate. With the Y line low, corresponding to a negative input, Q8 and Q10 are cut off and the vertical segment does not illuminate.

3-24. DECODER DRIVER. The Decoder Driver U5 translates the BCD information on the W-X-Y-Z lines for application to the LED readouts DS2, DS3, and DS4. Low inputs are provided by the Decoder Driver through a resistor network RN1 to the LED segments for construction of decimal numbers.

3-25. DECIMAL POINT. LED readouts DS2, DS3, and DS4 contain a decimal point segment. Illumination of a decimal point is controlled by the RANGE switch selected. This causes the resistor network RN2 to supply a negative voltage to the cathode of the decimal segment. Note on the schematic that the 20MΩ FUNCTION, which requires no RANGE selection, shares the 20 RANGE decimal point on DS2.

3-26. ANODE CONTROL. The Anode Control circuit, Q11 through Q18, applies +5 volts dc to the anodes of the LED readouts. Strobe pulses (S1-S2-S3-S4) from the Digital I.C. determines which readout receives the proper anode voltage at a particular time. For example, when S2 goes high Q12 and Q16 turn on and apply approximately +5 volts dc to the anodes of the LED segments on DS2. Those segments with negative voltages on their cathodes, at S2 time, will illuminate and form a decimal number.

3-27. LED READOUTS. The LED readouts DS2, DS3, and DS4 each contain seven and one-half diode segments. One-half segment for a decimal point and 7 segments to form decimal numbers. The number forming segments are designated A through G in each readout on the schematic.

3-28. Readout DS1 indicates the most significant digit (MSD) and polarity. Two segments form a numerical "1" and two segments to form the polarity signs. Control of the MSD "1" indication is separate from the other readouts. BCD information comes from the Z line during the S1 time period. When line Z is high during time S1, Q7, and Q9 turn on to allow the "1" segment to illuminate.

3-29. Signal Conditioning

3-30. INPUT VOLTAGE DIVIDER. Three series connected resistors (R1, R2, and R3) totaling 10 megohms are tapped to provide division ratios of 100 or 1000 to 1. Division ratios for each voltage range are tabulated in the schematic diagram, sheet 1.

3-31. Trimming capacitors are connected across the Input Voltage Divider to maintain a flat frequency response when used for ac voltages. High frequency compensation during calibration can be accomplished with variable trimmer capacitor C3.

3-32. CURRENT SHUNTS. The current shunts consist of resistors R44 through R48. Series connected resistors R44 through R47 are switched into the circuit, depending upon the RANGE selected. The resistor steps are 1000, 100, 10, and 1 ohms for the 0.2, 2, 20, and 200 milliampere ranges respectively. A separate 100 milliohm four terminal shunt is used for the 2000 milliampere range.

3-33. The maximum voltage developed across a single shunt or combination for full range indication is 0.2 volts. Current overload protection above 2 amperes is provided by fuse F2. The shunts are protected against over-voltage by diodes CR9 through CR12.

3-34. AC CONVERTER. The AC Converter consists of a buffer and an active rectifier (refer to Figure 3-3). Transistor Q1, connected as a voltage follower, operates as a buffer for the active rectifier. The buffer output is applied as a voltage, e_{in}, to the non-inverting input of operational amplifier U1. Negative feedback causes the voltage at the inverting input to follow the non-inverting input, causing a current, $e_{in}/R2$, through R2 to ground. Since diodes CR1 and CR2 conduct on alternate half cycles, one-half the average current flows through R1. The rectified voltage developed across R1 is filtered by R3 and C1 to produce the dc voltage required for the A/D Converter.

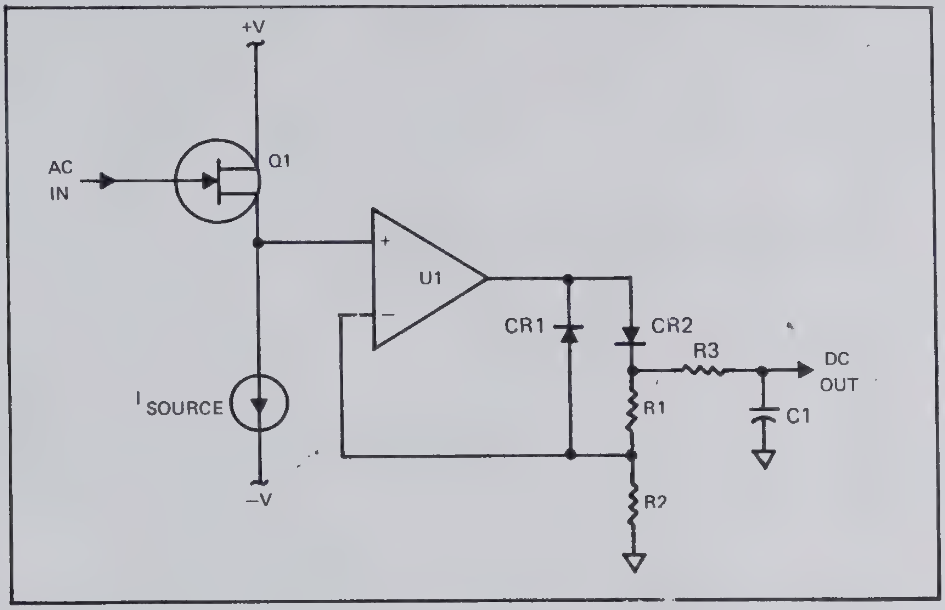


Figure 3-3. AC CONVERTER SIMPLIFIED DIAGRAM

3-35. The input to the AC Converter is in either the 0.2 volt or 2 volt basic range. To accommodate either range, the gain of the operational rectifier is adjusted accordingly by changing the feedback resistor (symbolized by R2). In the instrument, R51 sets the gain at 1 for the 2 volt basic range. For the 0.2 volt basic range, the gain is increased to 10 by switching R50 in parallel with R51.

3-36. OHMS CONVERTER. The Ohms Converter supplies a dc voltage, proportional to the unknown resistance, to the A/D Converter. A simplified diagram of the circuit elements involved is illustrated in Figure 3-4. Operational Amplifier U2 bootstraps the current source. With the non-inverting input connected to the junction of R_A and R_X, current will flow through R_A and R_X such that a constant voltage is maintained across R_A for a given RANGE. If R_X is within the RANGE selected, the voltage developed will be proportional to the value of R_X. For resistance ranges 200 ohms through 2000 kilohms, the constant voltage maintained is 10 volts. In the 20 megohm range, U2's feedback resistor, R_F, is changed so that a 1 volt potential is maintained.

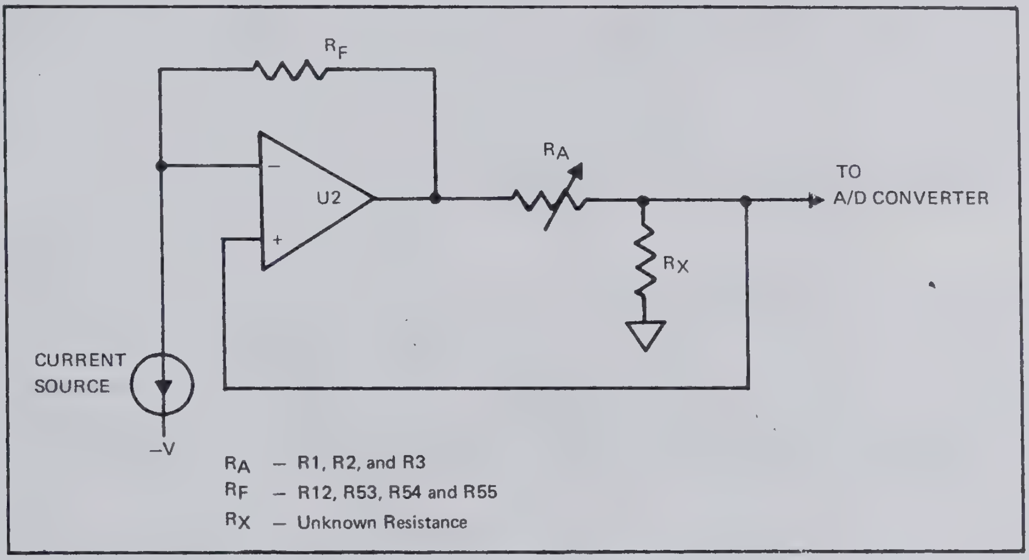


Figure 3-4. OHMS CONVERTER SIMPLIFIED

3-37. ACTIVE FILTER. The Active Filter ensures that the input to the A/D Converter receives only dc voltages. The operational amplifier (U2) used for the Ohms Converter is also used in conjunction with R18, C11, R19, and C12 to form a two pole Bessel type active filter (see Figure 3-5). A cutoff frequency of 10Hz and a 60Hz rejection ratio of 32db is provided by this filter. Normal mode rejection at frequencies other than even multiples of the integration period is also provided. Overloading of the A/D Converter by large ripple voltages is prevented by the filter.

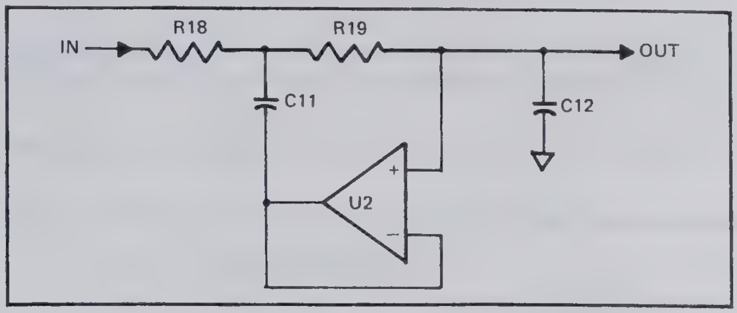


Figure 3-5. ACTIVE FILTER SIMPLIFIED DIAGRAM

3-38. Power Supply

3-39. LINE POWER. The line power supply, shown in sheet 2 of the schematic diagram, provides ±15 and +5 volts dc. Diode bridge CR15 through CR18 and filter capacitors C17 and C18 supply an unregulated ±15 volts. Further conditioning by Q19, CR19, Q24, and CR8 provide the regulated ±15 volts dc. Diodes CR13 and CR14, and filter capacitor C19 supply an unregulated +5 volts.

3-40. BATTERY POWER. The Model 8000A–01 utilizes the battery operated power supply diagrammed on the schematic. With the POWER switch ON, the battery is connected to the input of the dc to dc converter consisting of Q22, Q23, T2, CR15 through CR18, C17, and C18. Transistors Q22 and Q23 and transformer T2 form a 4kHz multivibrator. The multivibrator signal is coupled by T2 to the diode rectifiers CR15 through CR18. Capacitors C17 and C18 filter the rectified voltage to supply the ±15 volts. The unregulated +5 volts is supplied by the battery.

3-41. The battery is charged whenever the instrument is connected to ac line power. Transformer T1, CR13, and CR14 provide the rectified voltage. A lamp, DS5, in parallel with R21 acts as a dynamic current control that limits the charging current to approximately 450 milliamperes. With the instrument connected to line power and the POWER switch OFF, approximately 400 to 450 milliamperes can be supplied to a discharged battery. Approximately 100 millamperes can be supplied when the instrument is switched on.

SECTION 4

MAINTENANCE

4-1. INTRODUCTION

4-2. This section contains information concerning preventive and corrective maintenance for the Model 8000A Digital Multimeter. The information is arranged under the following headings: SERVICE INFORMATION, GENERAL MAINTENANCE, PERFORMANCE TEST, and CALIBRATION PROCEDURE.

4-3. A calibration interval of one year is recommended to ensure instrument operation within the one year specifications. These specifications may be found in Section 1.

4-4. Table 4-1 lists the recommended test equipment. If this equipment is not available, other equipment having equivalent specifications may be used.

Table 4-1. TEST EQUIPMENT

EQUIPMENT NOMENCLATURE	USE	SPECIFICATIONS	RECOMMENDED EQUIPMENT
DC Voltage Source	Calibration, Performance Checks, Troubleshooting	190mV to 1200V ±0.03%	Fluke Model 341A
DC Current Source	Calibration, Performance Checks	190μA to 1.9A ±0.1%	Fluke Model 382A
AC Volatage Source	Calibration, Performance Checks	190mV to 1200V (45Hz to 10kHz) ±0.1% 190mV to 1200V (10kHz to 20kHz) ±0.2%	Fluke Models 5200A/5205A
AC Current Source	Performance Checks	190μA to 190mA (100Hz to 10kHz) ±0.3% 1.9A (100Hz to 3kHz) ±0.3%	Optimation AC 105, and Fluke Models 540B, 382A, A45, and A40 shunts (20mA, 200mA, and 2A)
Resistors	Calibration	190Ω, 1.9kΩ, 19kΩ, 1.9MΩ, and 19MΩ ±0.1%	————————
Frequency Counter	Calibration	To measure positive 100 msec. pulse with 1μsec resolution.	Hewlett-Packard 5326A

4-5. SERVICE INFORMATION

4-6. A unique 48 hour turnaround service is provided for the Model 8000A. Should your instrument need repair, send it to the nearest factory authorized service center. A list of these authorized service centers is located on the inside of the front cover.

4-7. The WARRANTY is also located at the front of this manual and warrants the instrument for a period of one year. In order for the warranty to become effective, the validation card included in the manual must be completed and returned to the John Fluke Mfg. Co., Inc.

4-8. GENERAL MAINTENANCE

4-9. Access

4-10. Use the following procedure to gain access to the interior of the Model 8000A.

a. With the power switch OFF, disconnect the line cord.

b. Remove the Phillips screw at the rear of the instrument case.

c. Remove the instrument from the case.

CAUTION!

When soldering or desoldering on the Model 8000A-01 PCB, either remove one of the batteries or place a thin insulating material between a battery and the holder contact.

4-11. Cleaning

4-12. Clean the front panel and case with denatured alcohol or a mild solution of detergent and water. Do not use aromatic hydrocarbons or chlorinated solvents because they will react with the plastic materials of the instrument.

4-13. Fuse Replacement

4-14. The input power fuse is located within the instrument in a fuse clip near the power transformer (T1). To gain access to the fuse, refer to paragraph 4-9. When replacement is required, install AGC 1/8A as indicated on the decal on the underside of the instrument case.

4-15. The current shunt protection fuse is located behind the front panel. To remove the fuse, turn the MA input terminal in the direction indicated on the front panel. When replacement is required, install AGX 2A as indicated on the front panel and on the decal on the underside of the instrument case. Spare fuses can be stored in the underside of the carrying handle.

4-16. Battery Replacement (Option 8000A-01)

4-17. Follow the disassembly instructions below for removing the replaceable batteries in the Model 8000A-01.

a. Remove the instrument from the case (refer to paragraph 4-9.)

b. On the underside of the PCB, remove the two threaded bolts securing the battery holders.

c. Remove the holder tops and batteries.

d. Replace the batteries with 1.2 volt nickel-cadmium batteries (JF Part No. 346924). Install the batteries in the polarity indicated on the battery holder.

4-18. PERFORMANCE CHECKS

4-19. Environmental Conditions

4-20. The environmental conditions for conducting the performance checks are as follows.

a. Ambient Temperature — 22°C to 25°C (72°F to 77°F)

b. Relative Humidity —— 70%

4-21. "Zero" Checks

a. With the instrument energized, depress the DCV and 200MV pushbuttons.

b. Short the VΩ terminal to the COMMON terminal. The readout should indicate ≤1 digit.

c. Remove the short. The readout should indicate ≤ ±10 digits.

4-22. Normal Mode Rejection Check

a. With the instrument energized by line power, depress the VDC function and 20 range pushbuttons.

b. Apply ac power line voltage between the V-Ω and COMMON terminals.

c. The readout should indicate 0± 2 digits. (If necessary, refer to paragraph 4-30, Normal Mode Rejection Adjustment.)

4-23. Accuracy Checks

4-24. The accuracy checks compare the instruments performance to the accuracy specifications listed in Section 1. Use Table 4-3, disregarding the "ADJUSTMENT" column, since the display limits for a given input are listed. For the AC current performance checks, refer to Table 4-2, AC MA PERFORMANCE CHECKS.

4-25. CALIBRATION

4-26. Environmental Conditions

4-27. Instrument calibration should be accomplished under the following environmental conditions.

a. Ambient Temperature — 22°C to 25°C (72°F to 77°F)

b. Relative Humidity ——— 70%

4-28. "Zero" Checks

4-29. Verify that the open circuit and short circuit zero is within the limits specified in paragraph 4-21.

4-30. Normal Mode Rejection Adjustment

4-31. Refer to the Normal Mode Rejection Check in paragraph 4-22, to determine if adjustment is necessary. Should adjustment be required, use the following procedure.

a. Remove the instrument from the case (refer to paragraph 4-9).

b. Connect a frequency counter, set for period measurement, between TP5 (see Figure 4-1) and COMMON (or TP4).

c. Adjust R20, "PERIOD", for a 100,000 microsecond indication on the counter. Variations of the indication should be $\leq \pm 15$ μsec.

Table 4-2. AC MA PERFORMANCE CHECKS

FUNCTION/RANGE	INPUT	DISPLAY LIMITS
AC MA / 200μA	190μA @ 100 Hz	186.1 to 193.9
AC MA / 200μA	190μA @ 10 kHz	186.1 to 193.9
AC MA / 2	1.9 mA @ 100 Hz	1.861 to 1.939
AC MA / 2	1.9 mA @ 10 kHz	1.861 to 1.939
AC MA / 20	19 mA @ 100 Hz	18.61 to 19.39
AC MA / 20	19 mA @ 10 kHz	18.61 to 19.39
AC MA / 200	190 mA @ 100 Hz	186.1 to 193.9
AC MA / 200	190 mA @ 10 kHz	186.1 to 193.9
AC MA / 2000 MA	1.9 A @ 100 Hz	1861 to 1939
AC MA / 2000 MA	1.9A @ 3 kHz	1861 to 1939

4-32. Range Adjustments

4-33. Refer to Figure 4-1 for the location of the range adjustments. Table 4-3 lists the order of the adjustments and cardinal check points. Apply the inputs listed and adjust or check for in-limits indications.

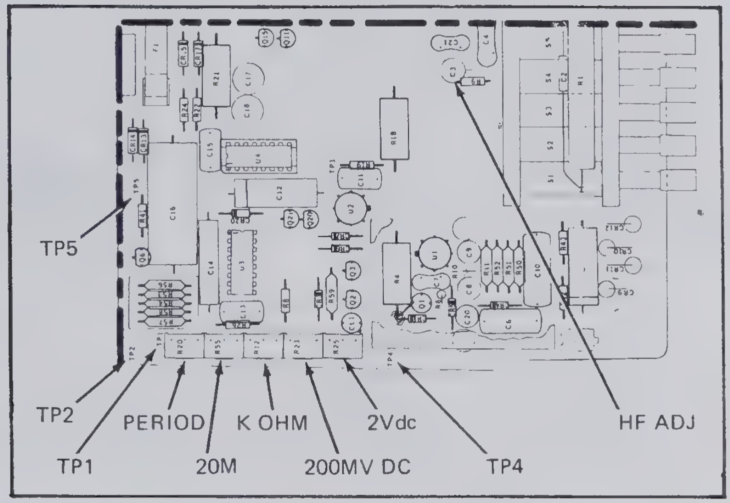


Figure 4-1. ADJUSTMENT AND TEST POINT LOCATIONS

Table 4-3. CALIBRATION

FUNCTION/RANGE	INPUT	ADJUSTMENT	DISPLAY LIMITS
DCV / 200 MV	+0.19V dc	"200 MVDC" (R23) Adjust for +190.0	+189.7 to +190.3
DCV / 200 MV	-0.19V dc	--------	-189.8 to -190.2
DCV / 2	+1.9V dc	"2 VDC" (R25) Adjust for +1.900	+1.897 to +1.903
DCV / 2	-1.9V dc	--------	-1.898 to -1.902
DCV / 20	+19V dc	--------	+18.97 to +19.03
DCV / 200	+190V dc	--------	+189.7 to +190.3
DCV / 1200V	+1000V dc	--------	+997 to +1003
20MΩ	19MΩ	"20 M" (R55) Adjust for 19.00	18.89 to 19.11
KΩ / 20	19KΩ	"K OHM" (R12) Adjust for 19.00	18.95 to 19.05
KΩ / 200Ω	190Ω	--------	189.5 to 190.5
KΩ / 2	1.9KΩ	--------	1.895 to 1.905
KΩ / 200	190KΩ	--------	189.5 to 190.5
KΩ /2000KΩ	1.9MΩ	--------	1895 to 1905

FUNCTION/RANGE	INPUT	ADJUSTMENT	DISPLAY LIMITS
DC MA / 200μA	+190μA	--------	+189.3 to +190.7
DC MA / 2	+1.9mA	--------	+1.893 to +1.907
DC MA / 20	+19mA	--------	+18.93 to +19.07
DC MA / 200	+190mA	--------	+189.3 to +190.7
DC MA / 2000 MA	+1.9A	--------	+1893 to 1907
ACV / 200 MV	190mV @ 100Hz	--------	188.8 to 191.2
ACV / 200 MV	190mV @ 20kHz	--------	189.1 to 190.9
ACV / 2	1.9V @ 100 Hz	--------	1.888 to 1.912
ACV / 2	1.9V @ 20kHz	--------	1.867 to 1.933
ACV / 20	19V @ 20kHz	"HF ADJ" (C3) Adjust for 19.00	18.67 to 19.33
ACV / 20	19V @ 10 kHz	--------	18.67 to 19.33
ACV / 200	190V @ 10 kHz	--------	186.7 to 193.3
ACV / 200	190 @ 20 kHz	--------	186.7 to 193.3
ACV / 1200V	1000V @ 100 Hz	--------	983 to 1007
ACV / 1200V	1000V @ 10 kHz	--------	981 to 1009

8000A

SECTION 5

5-1. INTRODUCTION

5-2. The parts list contains a complete breakdown of all the major assemblies followed by subsequent listings that itemize the components on each major assembly. Assemblies and subassemblies are identified by a reference designation beginning with the letter A followed by a number (e.g., A1 etc.). Electrical components appearing on the schematic diagram are identified by their schematic diagram reference designation. Components not appearing on the schematic diagram are consecutively numbered throughout the parts list. Flagnotes are used throughout the parts list and refer to special ordering explanations.

5-3. A manufacturer's cross reference list follows the parts list. The manufacturer's part number and Federal Supply Code are listed opposite the John Fluke Mfg. Co. part number for the item.

5-4. COLUMN DESCRIPTION

a. The REF DESIG column indexes the item description to the associated illustration.

b. The DESCRIPTION column describes the salient characteristics of the component. Indention of the description indicates the relationship to other assemblies, components, etc. Those component descriptions that are unique to the Model 8000A–01 are designated by the model number in paranthesis following the description.

c. The six-digit part number, by which the item is identified at the John Fluke Mfg. Co., is listed in the STOCK NO. column.

d. The TOT QTY column lists the total quantity of the items used in the instrument and reflects the latest Use Code. Second and subsequent listings of the same item are referenced to the first listing with the abbreviation REF.

e. Entries in the REC QTY column indicate the recommended number of spare parts necessary to support one to five instruments for a period of two years. This list presumes an availability of common electronic parts at the maintenance site.

f. The USE CODE column identifies certain parts which have been added, deleted or modified during the production of the instrument. Each part for which a Use Code has been assigned may be identified with a particular instrument serial number by consulting the Serial Number Effectivity List at the end of the parts list. All parts with no code are used on all instruments with serial numbers above 123.

8000A

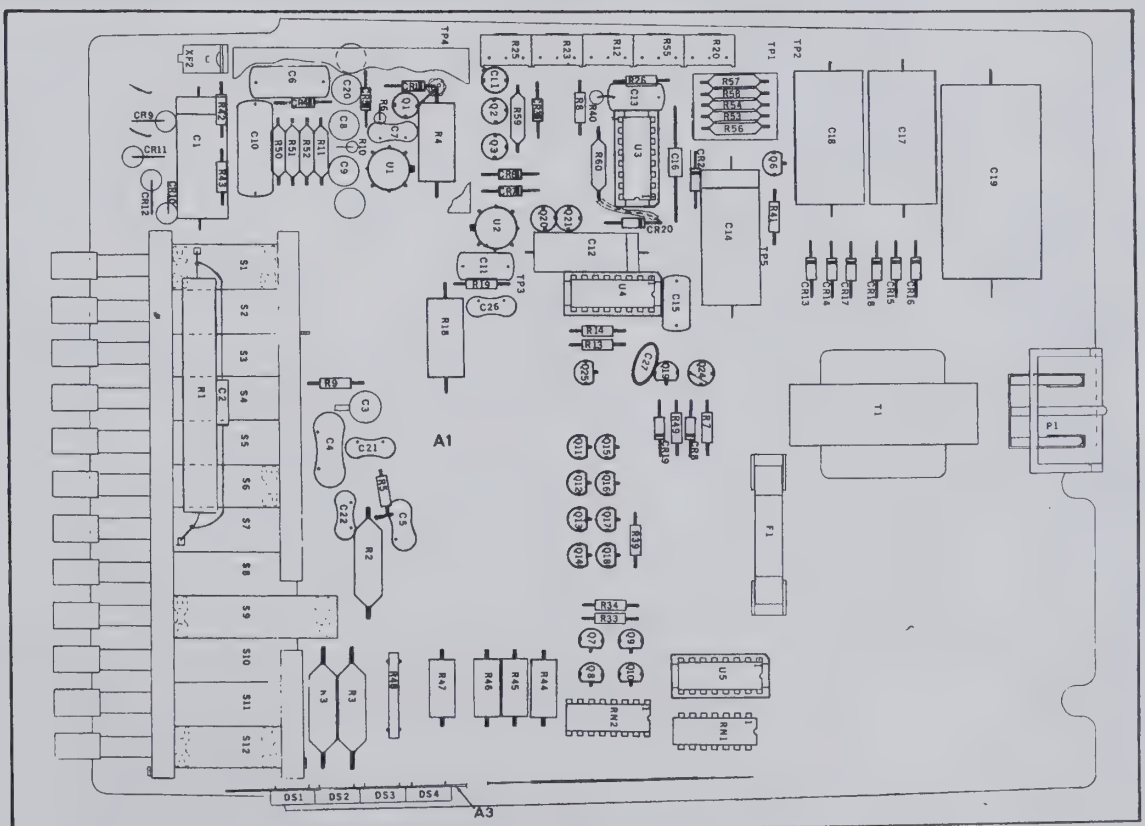


Figure 5-1. 8000A MAIN PCB ASSEMBLY

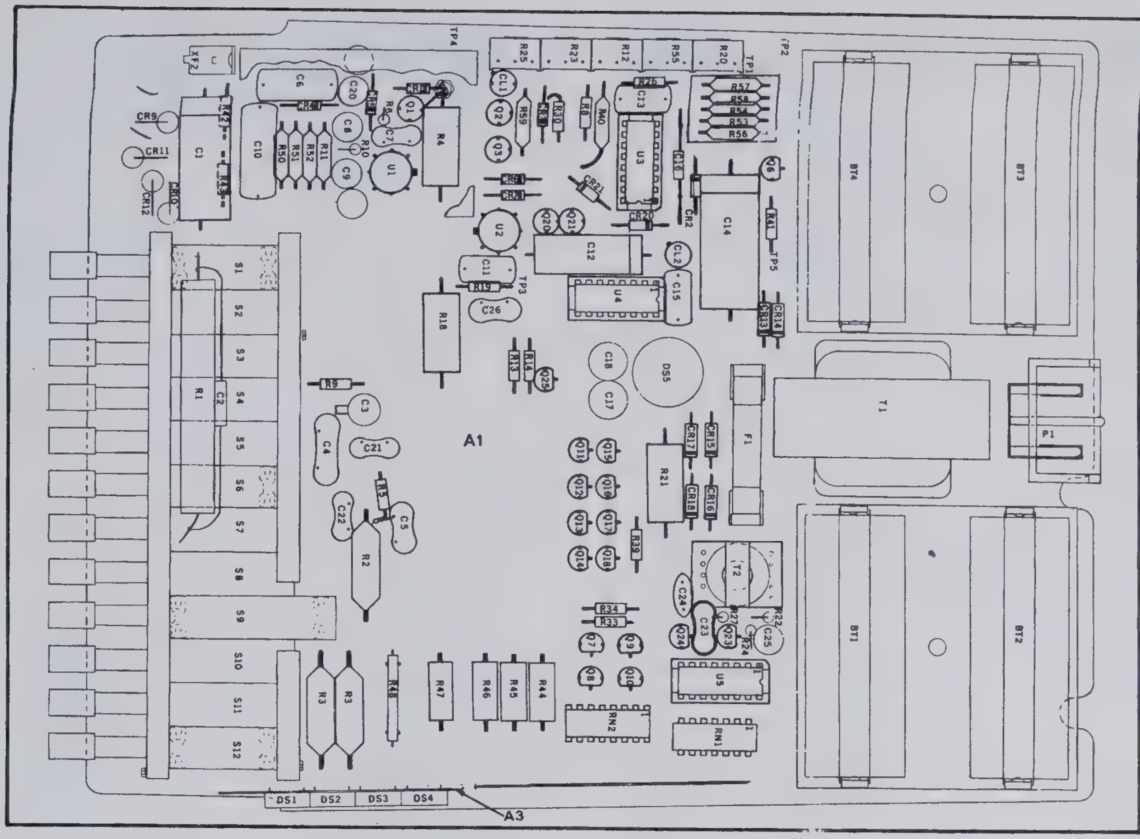


Figure 5-2. 8000A–01 MAIN PCB ASSEMBLY

REF DESIG	DESCRIPTION	STOCK NO	TOT QTY	REC QTY	USE CODE
	8000A DIGITAL MULTIMETER INSTRUCTION MANUAL	347906	1		
	DIGITAL MULTIMETER Figure 5-1 & Figure 5-2	8000A & 8000A-01			
A1	Main PCB Assembly (8000A)	338293	1		
	Main PCB Assembly (8000A/10)	346106	1		
	Main PCB Assembly (8000A/23)	346114	1		
	Main PCB Assembly (8000A-01)	345967	1		
	Main PCB Assembly (8000A-01/10)	346080	1		
	Main PCB Assembly (8000A-01/23)	346098	1		
A2	FRONT PANEL ASSEMBLY				
A3	DISPLAY ASSEMBLY	338376	1		
	Case, molded	330076	1		
	Handle, molded	330992	1		
	Line Cord Assembly	343723	1		
	Line Cord Assembly (/10 & /23)	343780	1		
	Pad, foot	338632	4		
	Test Lead Set	343657	1		
A1	MAIN PCB ASSEMBLY	REF			
BT1, BT2, BT3, BT4	Battery, 1.2V, Ni Cad, (8000-01 only)	346924	4		
C1	Cap, plstc, 0.033μf, 1200V	352120	1		
C2	Cap, porcelain, 5.1pf 1V	347948	1		
C3	Cap, var, cer, 4.5 to 50pf +70/−20%	321117	1	1	
C4	Cap, mica, 560pf ±5%, 500V	170431	1		
C5	Cap, mica, 56pf ±5%, 500V	148528	1		
C6, C15	Cap, plstc, 0.22μf ±10%, 250V	194803	2		
C7	Cap, mica, 33pf ±5%, 500V	160317	1		
C8	Cap, ta 68μf ±10%, 15V	193615	1		
C9, C20, C23	Cap, ta, 10μf ±20%	330662	3		
(C9, C20, C25)	Cap, ta, 10μf ±20%, (8000A-01 only)	330662	3		
C10	Cap, plstc, 0.07μf ±10%, 250V	184366	1		
C11	Cap, plstc, 0.033μf ±10%, 250V	234492	1		
C12	Cap, poly, 0.022μf ±10%, 100V	333823	1		
C13	Cap, plstc, 0.047μf ±10%, 250V	162008	1		
C14	Cap, fxd, poly, 0.22μf ±5%, 50V	348359	1		
C16	Cap, fxd, poly, 390pf ±5%, 50V	348367	1		
C17, C18	Cap, elect, 400μf ±50/−10%, 25V	168153	2	1	
	Cap, tant, 47μf ±20%, 20V (8000A-01 only)	348516	2		
C19	Cap, elect, 4000μf 500mA, 10V	330761	1	1	
C21, C22	Cap, mica, 39pf ±5%, 500V	148544	2		
C24	Cap, cer, 0.0012μf ±10%, 500V (8000A-01 only)	106732	1		
C26	Cap, mica, 100pf ±5%, 500V	148494	1		
CL1, CL2	Diode, FED, cur. reg., 1000mA ±20% (CL2 used in 8000A-01 only)	348482	2	1	
CR1, CR4, CR5	Diode, sil, 75mA 25piv	241422	3	1	
CR2	Diode, Zener, 10V ±5%	246611	1		
CR3	Matched Set	2			
CR8, CR19	Diode Zener 15V ±5% (CR19 not used in 8000A-01)	352377	2	1	
CR6, CR7, CR13 thru CR18	Diode, Si, rectifier, 1 amp	343491	8	2	
(CR6, CR7)	Diode, Si, rectifier, 1 amp (8000A-01 only)	343491	2	1	
(CR13 thru CR18)	Diode, Si, 150 mA (8000A-01 only)	203323	6	2	
CR9 thru CR12	Diode, rectifier, Si, 2 amp 50V	347559	4	1	
CR20	Matched Set	1	1		
CR21	Diode Zener, 6.8V ±5%	352898	1		
DS5	Lamp, GE 63 (8000A-01 only)	352237			
F1	Fuse, slo blo 1/8 amp 250V	196790	1	5	
XF1	Fuse clip	284984	1		
XF2	Fuse contact	338665	1		
P1	Plug, 3 prong, power				
	Contact, voltage	338657	2		
	Contact, earth common	338640	1		
	Insulator, line contact	338624	1		
	Insulator, line contact (8000A-01 only)	344184	1		

REF DESIG	DESCRIPTION	STOCK NO	TOT QTY	REC QTY	USE CODE
Q1	Xstr, FET, N-Channel	288324	1	1	
Q2, Q3	Xstr, Si, NPN	168716	2	1	
Q7thruQ10, Q15 thru Q18	Xstr, Si, NPN	218396	8	2	
Q11 thru Q14, Q19	Xstr, Si, PNP (Q19 - Line models only)	340026 340026	4 1	1	
Q20	Xstr, Si, NPN	352138	1		
Q21	Xstr, Si, PNP	352146	1	1	
Q22, Q23	Xstr, Si, NPN (8000A-01 only)	330803	2	1	
Q24	Xstr, Si, NPN	168708	1		
Q25	Xstr, FET, N-Channel	261388	1	1	
R1, R2, R3	Resistor, matched Set	▷3	1		
R4	Res, comp, 100k ±10%, 2W	158659	1		
R5	Res, comp, 680k ±5%, 1/4w	188433	1		
R6	Res, comp, 4.7M ±5%, 1/4w	220046	1		
R8, R49	Res, fxd, car dep, 1k ±5%, 1/3w (R49 deleted from 8000A-01)	343426	2		
R9, R26	Res, comp, 100k ±5%, 1/4w	148189	2		
R10, R42, R43	Res, fxd, car dep, 470k ±5%, 1/3w	342634	3		
R11	Res, met flm, 10k ±1%, 1/8w	168260	1		
R12	Res, var, cermet, 500Ω ±10%, 1w	291120	1	1	
R13	Res, comp, 39k ±5%, 1/4w	188466	1		
R14	Res, comp, 3.3k ±5%, 1/4w	148056	1		
R18	Res, comp, 470k ±10%, 2w	110247	1		
R19	Res, fxd, car dep, 560k ±5%, 1/3w	342642	1		
R20	Res, var, cermet, 20k ±10%, 1/2w	291609	1	1	
R21	Res, comp, 22Ω ±5%, 2w (8000A-01 only)	352229	1		
R22	Res, comp, 330Ω ±5%, 1/4w (8000A-01 only)	147967	1		
R24	Res, comp, 82Ω ±5%, 1/4w (8000A-01 only)	149484	1		
R23	Res, var, cermet, 100Ω ±10%, 1w	285130	1	1	

REF DESIG	DESCRIPTION	STOCK NO	TOT QTY	REC QTY
R25	Res, var, cermet, 1k ±10%, 1/2w	285155	1	1
R27	Res, comp, 22Ω ±5%, 1/4w (8000A-01 only)	147967	1	
R30	Res, comp, 6.8k ±5%, 1/4w (8000A-01 only)	148098	1	
R33, R34, R41	Res, fxd, car dep, 3.9k ±5%, 1/3w	342600	3	
R39	Res, fxd, car dep 470Ω ±5%, 1/3w	343434	1	
R40	Res, met flm, 215k ±1%, 1/8w	289470	1	
R44 thru R47	Res, ww, matched set	▷4		
R48	Res, ww, 0.1Ω ±0.1%, 1/2w	345579	1	1
R50	Res, met flm, 498Ω ±0.1%, 1/8w	352252	1	
R51	Res, met flm, 4.53k ±0.1%, 1/8w	343467	1	
R52	Res, met flm, 10.02k ±0.1%, 1/8w	352245	1	
R53, R54	Resistor, matched set	▷2	1	
R55	Res, var, cermet, 50Ω ±10%, 1w	285122	1	1
R56, R57,	Resistor, matched set	▷1	1	
R59	Resistor, matched set	▷2	1	
R60	Resistor, met flm, 5.62k ±1%, 1/8w	235168	1	
RN1	Resistor network, 8 pc.	344069	1	1
RN2	Resistor network, fxd, 11pc.	344077	1	
S1 thru S12	Switch assembly, pushbutton	342915	1	1
T1	Xformer, 115V (8000A and 8000A-02) Xformer, 230V (8000A and 8000A-02) Xformer, 115V (8000-01) Xformer, 230V (8000-01) Xformer, 100V (8000A and 8000A-02) Xformer, 100V (8000A-01)	345629 345629 345637 345637 345645 345652	1 1 1 1 1 1	
T2	Xformer, inverter (8000A-01)	346049	1	
U1	I.C. Op. Amp. (AC Converter)	271502	1	
U2	I.C. Op Amp (Ohms Converter)	▷2	1	
U3	Analog I.C.	▷1	1	
U4	Digital I.C.	326017	1	1
U5	I.C., TTL, BCD to 7-Seg. (Decoder Driver)	340109	1	1

REF DESIG	DESCRIPTION	STOCK NO	TOT QTY	REC QTY	USE CODE
XF2	Contact, fuseholder (see J2XF2)	338665	1		
	Contact, battery (8000A-01 only)	344200	8		
	Holder, battery (8000A-01 only)	346932	2		
	Post, connector, uninsulated	267500	3		
	Shield, AC Converter	338673	1		
	Socket, I.C., 16 pin, Dual-in-Line (U3, U4, U5)	351916	3		
	Socket, Short, 10-Contact	347815	1		
	1 CR20, R56, R57, R58, and U3 are a matched set. For replacement, order ANALOG I.C. RESISTOR SET, STOCK NO. 345496.				
	2 CR3, R53, R54, R59, and U2 are a matched set. For replacement, order OHMS CONVERTER RESISTOR SET, STOCK NO. 345504.				
	3 R1, R2, and R3 are a matched set. For replacement, order INPUT DIVIDER RESISTOR SET, STOCK NO. 306407.				
	4 R44, R45, R46, and R47 are a matched set. For replacement, order CURRENT SHUNT RESISTOR SET, STOCK NO. 312611.				
	NOTE If one or more components in a set require replacement, the entire set must be replaced.				

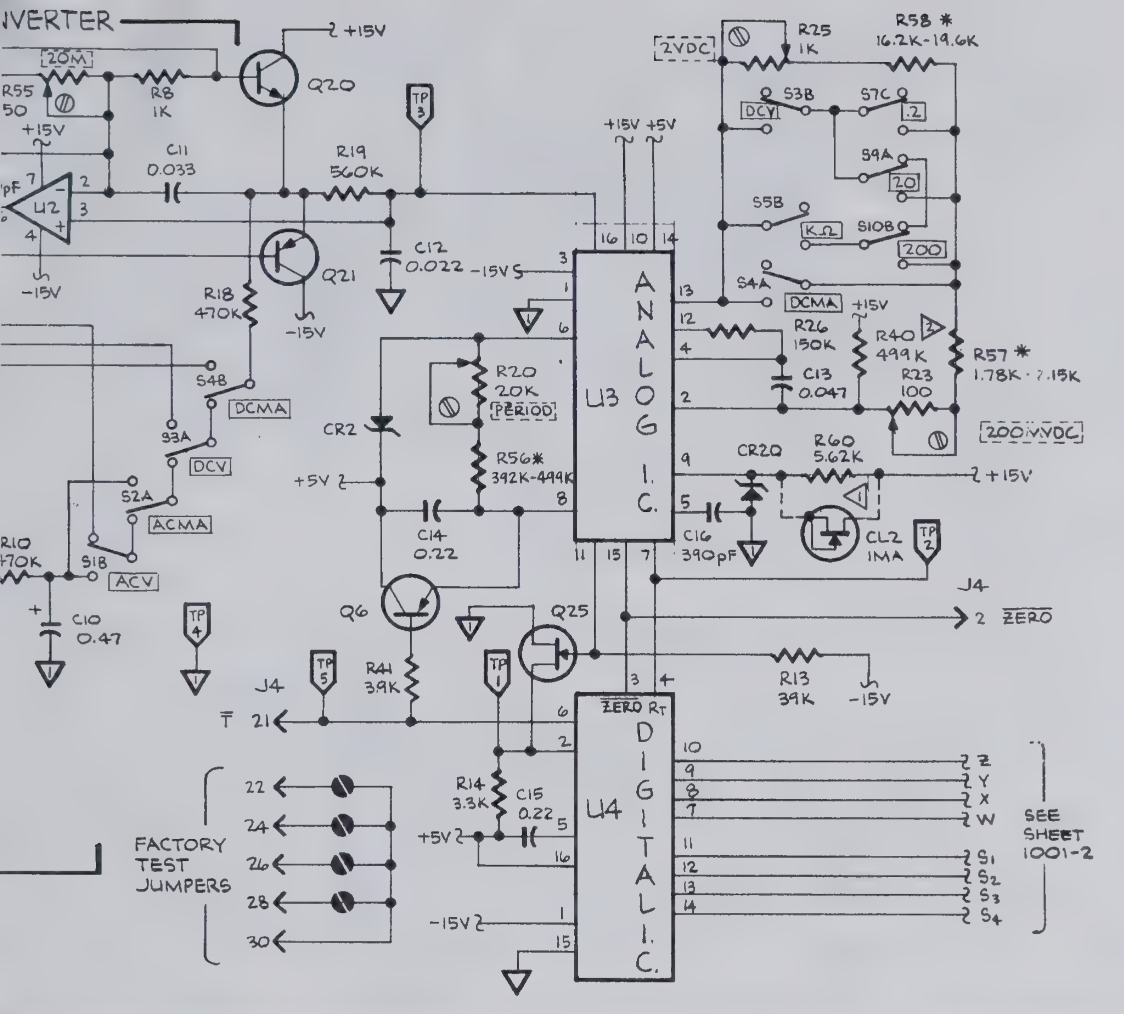
REF DESIG	DESCRIPTION	STOCK NO	TOT QTY	REC QTY	USE CODE
A2	FRONT PANEL ASSEMBLY				
F2	Fuse, fast acting, 2 amp	346940	1	5	
J1	Jack, banana, red	162065	1		
J2/XF2	Jack/Fuseholder, banana/barrel, red	345611	1		
J3	Jack, banana, black	162073	1		
	Lens, red	336616	1		
	Retainer, Neoprene Grommet	352484	2		
	Panel, front, molded (no decal)	330084	1		
	Decal, Front Panel	343756			
A3	DISPLAY ASSEMBLY	REF			
DS1	Diode, Light-emitting, alpha numeric, (± & 1) red	334581	1	1	
DS2, DS3,	Diode, Light-emitting, alpha numeric, (0-9) red	334573	3	1	
	Printed Circuit, Display	338343	1		

MANUFACTURERS' CROSS REFERENCE LIST

FLUKE STOCK NO.	MFR.	MFR. PART NO.	FLUKE STOCK NO.	MFR.	MFR. PART NO.
106732	71590	CF122	271502	12040	LM301A
110247	01121	RC42GF	284984	89536	284984
147884	01121	CB2205	285122	71450	360S-500A
147967	01121	CB3315	285130	71450	360S-101A
148056	01121	CB3325	285155	71450	360S-102A
148098	01121	CB6825	288324	15818	U2412
148189	01121	CB1045	288761	07933	RS2048
148528	14655	CD15F560J	289470	91637	MFF1/8
148544	14655	CD15E390J	291120	71450	360S-501A
149484	01121	CB8205	291609	71450	360S-203A
158659	01121	HB1041	306407	89536	306407
160317	14655	CD15E330J	312611	89536	312611
162065	.74970	108-902	321117	73899	DVJ305A
162008	73445	C280AEA47K	326017	89536	326017
162073	74970	108-903	330076	89536	330076
168153	73445	C437ARF400	330084	89536	330084
168260	91637	Type MFF 1/8	330092	89536	330092
168708	03508	2N3391	330662	12954	D10GSB20M
168716	07263	S19254	330761	99392	61C10AS43
170431	14655	CD19F561J	330803	07263	MPS6560
184366	73445	C280AE/A470K	333823	02799	IPJ223K
188433	01121	CB6845	334573	29083	MAN10A
188466	01121	CB3935	334581	29083	MAN101A
193615	56289	196D686X0015	335455	89536	335455
196790	71400	Type AGC	336616	89536	336616
203323	03508	DHD1105	338293	89536	338293
218396	04713	2N3904	338376	89536	338376
220046	01121	CB4755	338624	89536	338624
234492	73445	C280AE/A33K	338632	89536	338632
241422	03508	IN4009	338640	89536	338640
261388	04713	SPF179	338657	89536	338657
267500	89536	267500	338665	89536	338665

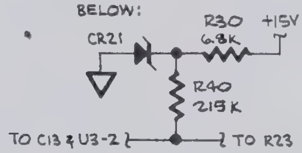
MANUFACTURERS' CROSS REFERENCE LIST

FLUKE STOCK NO.	MFR.	MFR. PART NO.	FLUKE STOCK NO.	MFR.	MFR. PART
338673	89536	338673	346932	89536	346932
340026	04713	MPS6563	346940	89536	346940
340109	18324	SN7447	347542	89536	347542
342600	Toyo Electronics	R33	347559	14099	IN5400
342634	Toyo electronics	R33	347815	82305	14-77
342642	Toyo Electronics	R33	347948	89536	347948
342915	89536	342915	348482	17856	E505
343426	Toyo Electronics	R33	348516	56289	196D
343434	Toyo Electronics	R33	348359	13934	H8S
343467	91637	MFF1/8	348367	12934	H8S
343491	11711	IN4002	351916	82305	14-40P
343657	89536	343657	352138	89536	352138
343723	89536	343723	352229	01121	HB
343780	89536	343780	352237	08806	63
344069	89536	344069	352245	91637	MMF1/8
344077	89536	344077	352252	91637	MMF1/8
344184	89536	344184	352377	03877	SV4823
344200	89536	344200	352898	89536	352898
345496	89536	345496			
345504	89536	345504			
345579	89536	345579			
345611	89536	345611			
345629	89536	345629			
345637	89536	345637			
345645	89536	345645			
345652	89536	345652			
346049	89536	346049			
346924	89536	346924			



NOTES:

1. ALL CAPACITANCE IN MICROFARADS AND ALL RESISTANCE IN OHMS UNLESS OTHERWISE NOTED.
2. * FACTORY SELECTED PART($).
3. ALL SWITCHES SHOWN IN NON-DEPRESSED POSITION.
4. SUPPLY COMMON.
   SIGNAL COMMON.
5. J4 - BOARD EDGE CONNECTOR.
6. PCB JUMPER
7. INTERNAL ADJUSTMENT
8. 1 RESISTOR USED IN LINE POWERED INSTRUMENTS. CURRENT REGULATOR USED IN BATTERY POWERED INSTRUMENTS.
9. ** COMPONENT MAY NOT BE INSTALLED.
10. FRONT PANEL DESIGNATION.
11. INTERNAL DESIGNATION.
12. 1, 2 MATCHED SETS.
13. 2 CONFIGURATION SHOWN FOR 8000A & 8000A-02. 8000A-01 AS SHOWN BELOW:

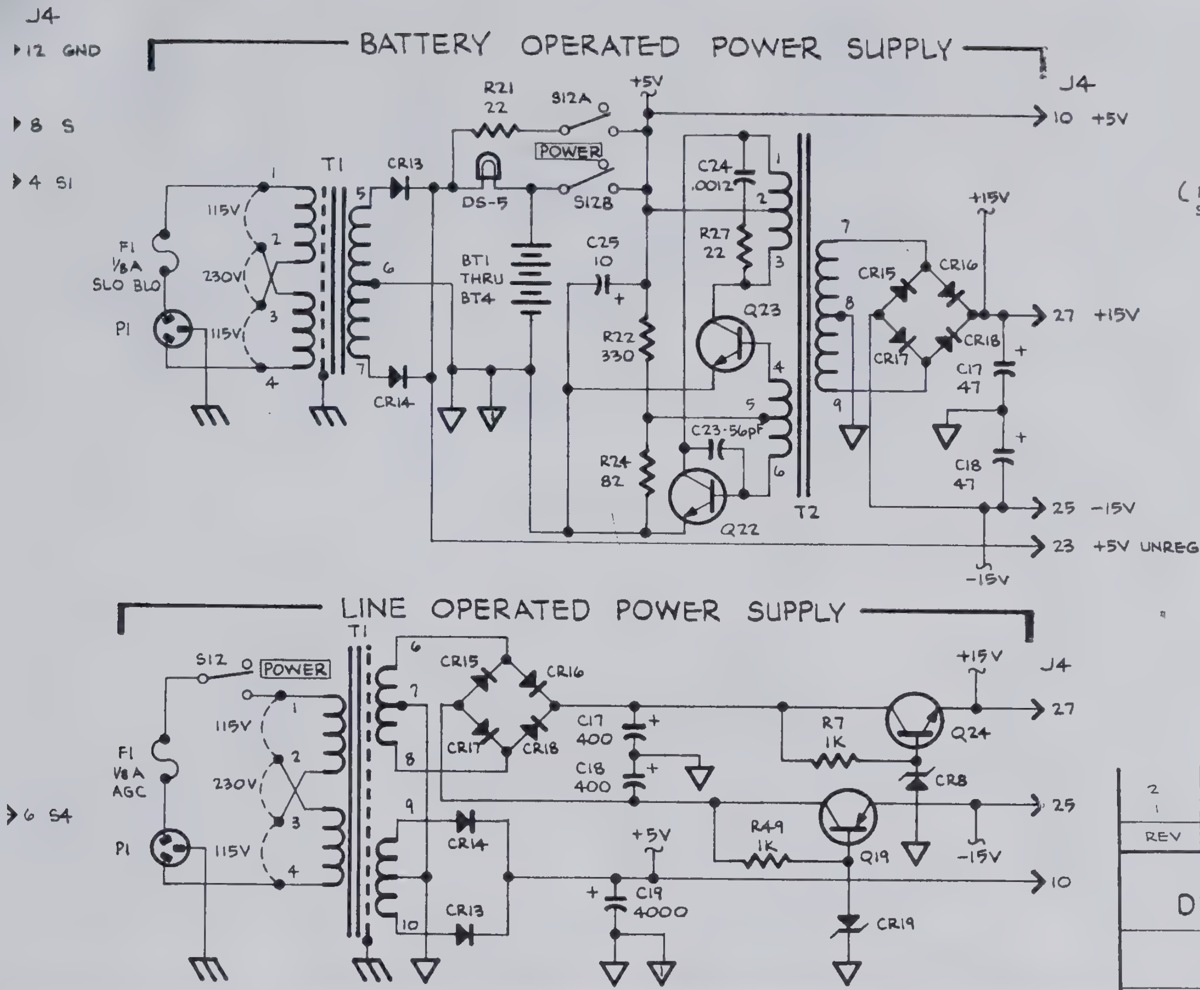


2	ADD: C23, R40, NOTE 13; CHG C6, C15
1	INITIAL ISSUE
REV	DESCRIPTION

8000A
DIGITAL MULTIMETER

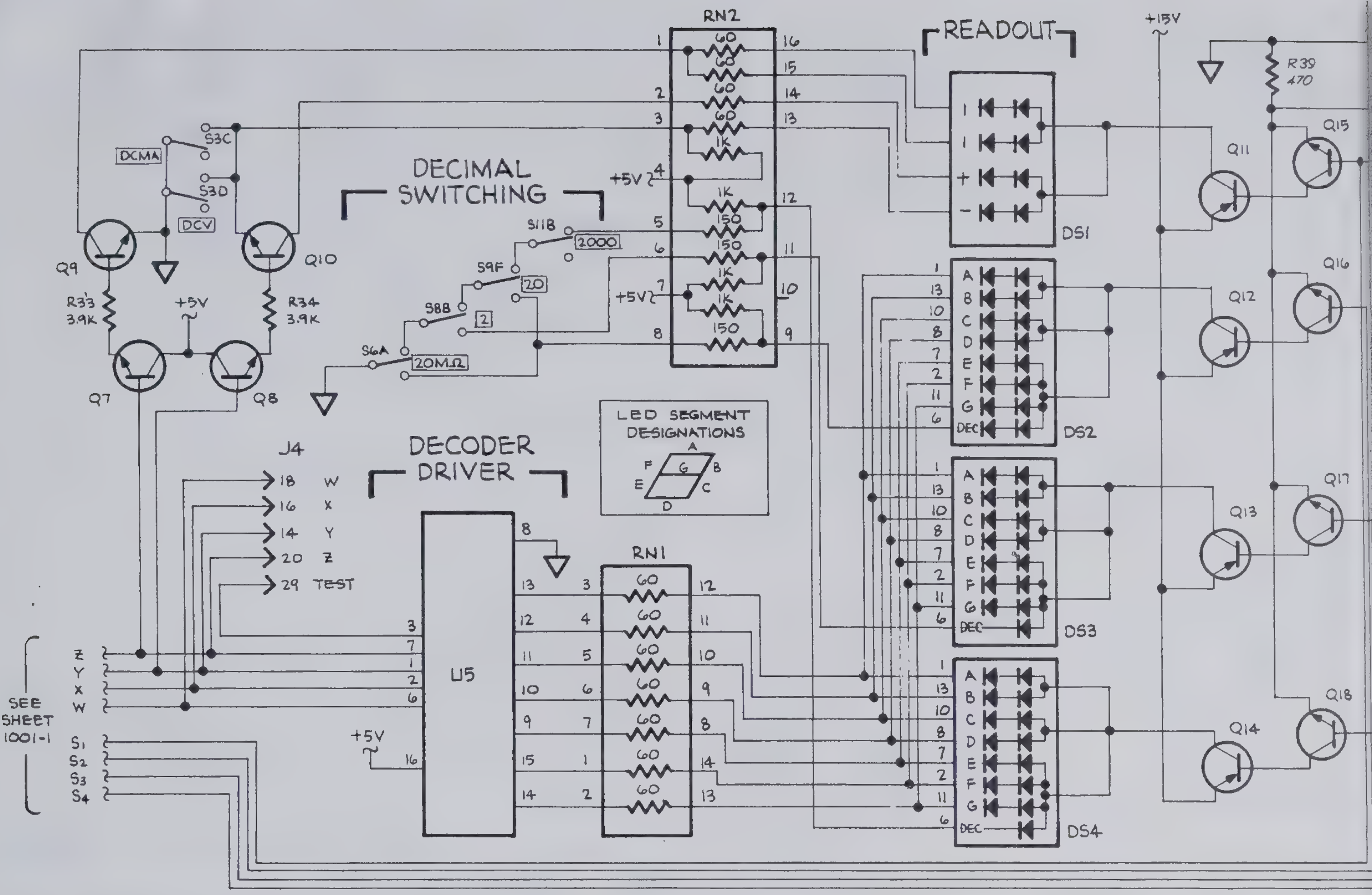
8000A-1001

DATE	OCTOBER, 1972	SHEET 1 OF 2

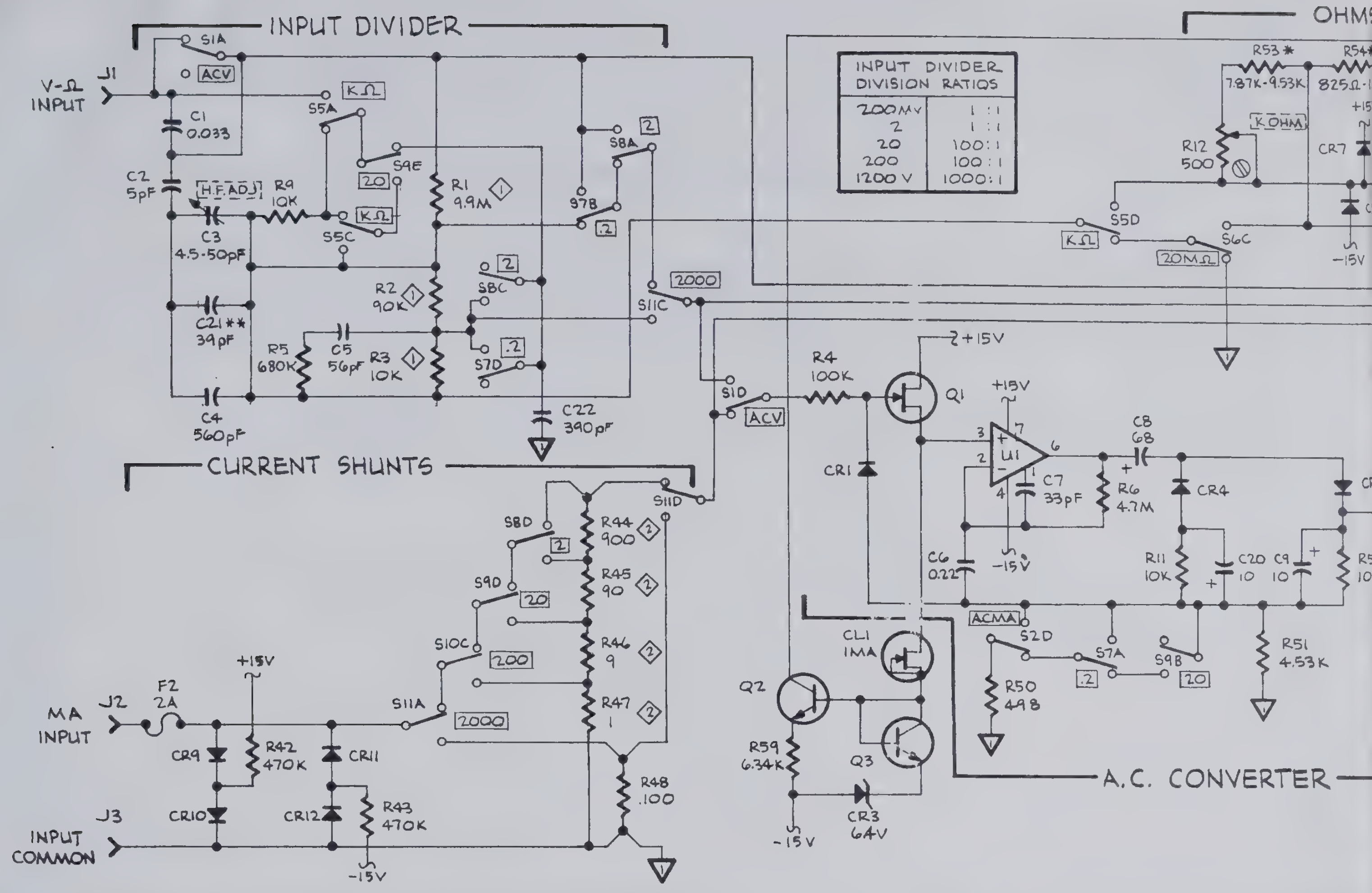


(FOR ENGINEERING NOTES SEE SHEET 8000A-1001-1)

REV	DESCRIPTION	
2	ADD: C23, R40, NOTE 13: CHG. C6, C15	
1	INITIAL ISSUE	
8000A DIGITAL MULTIMETER		
8000A-1001		
DATE	OCTOBER, 1972	SHEET 2 OF 2



RN2
READOUT
+15V
R39
470
Q15
Q11
Q16
Q12
Q17
Q13
Q18
Q14
DS1
DS2
DS3
DS4
DECIMAL SWITCHING
S11B
2000
S9F
20
S8B
2
S6A
20MΩ
DCMA
S3C
S3D
DCV
Q9
Q10
Q7
Q8
R33
3.9K
R34
3.9K
+5V
LED SEGMENT DESIGNATIONS
DECODER DRIVER
J4
18 W
16 X
14 Y
20 Z
29 TEST
U5
RN1
SEE SHEET 1001-1
Z
Y
X
W
S1
S2
S3
S4


INPUT DIVIDER
OHMS
INPUT DIVIDER DIVISION RATIOS
200MV 1:1
2 1:1
20 100:1
200 100:1
1200 V 1000:1
V-Ω INPUT
J1
S1A
ACV
KΩ
S5A
C1 0.033
C2 5pF
H.F. ADJ
R9 10K
C3 4.5-50pF
S5C
S9E
20
R1 9.9M
S7B
S8A
2
.2
R2 90K
R3 10K
R5 680K
C5 56pF
C21** 39pF
C4 560pF
S8C
S7D
S11C
2000
C22 390pF
R53* 7.87K-9.53K
R54*
K OHM
R12 500
CR7
S5D
S6C
20MΩ
+15V
-15V
R4 100K
Q1
S1D
CR1
U1
C7 33pF
R6 4.7M
C8 68
CR4
C6 0.22
R11 10K
C20 10
C9 10
ACMA
S2D
S7A
S9B
R50 49.8
R51 4.53K
CURRENT SHUNTS
S11D
S8D
R44 900
R45 90
R46 9
R47 1
S9D
S10C
200
S11A
R48 .100
MA INPUT
J2
F2 2A
CR9
R42 470K
CR11
CR10
CR12
R43 470K
J3
INPUT COMMON
CL1 1MA
Q2
Q3
R59 6.34K
CR3 6.4V
A.C. CONVERTER

least every 90 days. Storage temperatures below 25° C are recommended.

On page 4-3, paragraph 4-17, add after step d:

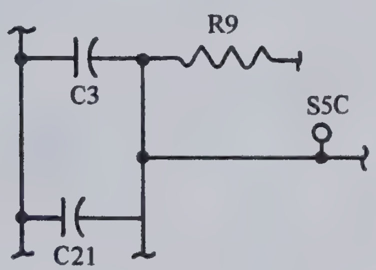
CAUTION!

Damage may result if alkaline, zinc-carbon or mercury batteries are charged.

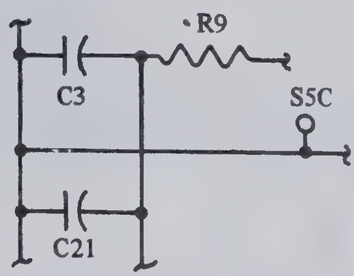
On page 5-5, delete "slo blo" from F1 description and add: fast acting. Add an additional description for F1 as follows: Fuse, slo blo, 1/8 amp 250V (8000A-01), Stock No. 166488, Tot. Qty. 1, Rec. Qty 5. Delete C22 from "C21, C22" and add new listing as follows: C22; cap mica, 390 pf $\pm$ 5%, 500V; Stock No. 148437; Tot. Qty. 1.

On schematic diagram, sheet 1 of 2, change C5 (near U2) to C26 and change value of R9 (INPUT DIVIDER) to 100K. Make the following change to the INPUT DIVIDER:

From



To



2/27/73

FLUKE®

8000A digital multimeter

JOHN FLUKE MFG. CO., INC. P.O. BOX 43210 MOUNTLAKE TERRACE, WASHINGTON 98043

CERTIFICATE of CALIBRATION

MODEL 8000A

The John Fluke Mfg. Co., Inc. does hereby certify the above listed instrument meets or exceeds all published specifications and has been calibrated using standards whose accuracies are traceable to the National Bureau of Standards within the limitations of the Bureau's calibration services, or have been derived from accepted values of natural physical constants, or have been derived by the ratio type of self-calibration techniques.

METROLOGY SYSTEMS
SEAL OF CERTIFIED CALIBRATION

Applicable NBS Test Reports:
DC Voltage — 207627
AC Voltage — 807675
Resistance — 207693

William V. Fetrow
STANDARDS ENGINEER

Thomas B. Smith
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COMPLETE AND RETURN THIS CARD TO ASSURE YOUR WARRANTY

WARRANTY

The JOHN FLUKE MFG. CO., INC.* warrants each instrument manufactured by them to be free from defects in material and workmanship. Their obligation under this Warranty is limited to servicing or adjusting an instrument returned to the factory for that purpose, and to making good at the factory any part or parts thereof; except tubes, fuses, choppers and batteries, which shall, within one year after making delivery to the original purchaser, be returned by the original purchaser with transportation charges prepaid, and which upon their examination shall disclose to their satisfaction to have been thus defective. If the fault has been caused by misuse or abnormal conditions of operations, repairs will be billed at a nominal cost. In this case, an estimate will be submitted before work is started, if requested.

If any fault develops, the following steps should be taken:

1. Notify the John Fluke Mfg. Co., Inc.,* giving full details of the difficulty, and include the Model number, type number, and serial number. On receipt of this information, service data or shipping instructions will be forwarded to you.
2. On receipt of the shipping instructions, forward the instrument prepaid, and repairs will be made at the factory. If requested, an estimate will be made before the work begins, provided the instrument is not covered by the Warranty.

> "The foregoing warranty is in lieu of all other warranties, express or implied, including but not limited to, any implied warranty of merchantability, fitness or adequacy for any particular purpose or use. Fluke shall not be liable for any special, incident or consequential damages."

SHIPPING

All shipments of John Fluke Mfg. Co., Inc.* instruments should be made via Railway Express**prepaid. The instrument should be shipped in the original packing carton, or if it is not available, use any suitable container that is rigid. If a substitute container is used, the instrument should be wrapped in paper and surrounded with at least four inches of excelsior or similar shock-absorbing material.

CLAIM FOR DAMAGE IN SHIPMENT

The instrument should be thoroughly inspected immediately upon receipt. All material in the container should be checked against the enclosed packing list. The manufacturer will not be responsible for shortages against the packing sheet unless notified immediately. If the instrument fails to operate properly, or is damaged in any way, a claim should be filed with the carrier. A full report of the damage should be obtained by the claim agent, and this report should be forwarded to John Fluke Mfg. Co., Inc.* Upon receipt of this report, you will be advised of the disposition of the equipment for repair or replacement. Include the model number, type number, and serial number when referring to this instrument for any reason.

The John Fluke Mfg. Co., Inc.* will be happy to answer all application questions which will enhance your use of this instrument. Please address your requests to: JOHN FLUKE MFG. CO., INC., P.O. Box 43210, MOUNTLAKE TERRACE, WASHINGTON 98043*

* For European customers: FLUKE (Nederland) B.V.
Ledeboerstraat 27
Tilburg, Netherlands

**For European customers, Air Freight prepaid.

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TWX: 610-492-2119

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LIST OF ILLUSTRATIONS, *continued*

List of Tables

Section 1
Introduction & Specifications

1-1. INTRODUCTION

1-2. The Model 8000A is a compact and light-weight digital multimeter (DMM). It features a 3½ digit display, push-button selection of range and function, auto polarity, self locating decimal point, self zeroing to eliminate offset uncertainties, and overload protection for all ranges. Several options and accessories are also available for use with the 8000A.

1-3. Push-button controls allow the selection of five ac and dc voltage ranges, five ac and dc current ranges, and six resistance ranges. The measurement capabilities of the 8000A range from 100 microvolts to 1199 volts ac and dc, 100 nanoamperes to 1.999 amperes ac and dc, and 100 milliohms to 19.99 megohms.

1-4. The front-panel readout features a 3½ digit display using light emitting diodes (LED's). The display includes a self locating decimal point and a + or – polarity indicator. Full-scale readout is 1999 for all ranges and functions except the 1200 volt ac and dc range, which is 1199. A blinking full-scale readout indicates that the 8000A is being operated in an overrange condition.

1-5. Front panel input connectors are banana type and provide separate connections for common, current, and volt-ohm inputs. Both the current and volt-ohm inputs are referenced to the common input. Common is isolated from earth ground and can operate at a potential of up to ± 1200 volts peak with reference to earth ground.

1-6. The overload features of the 8000A include a fused current input and an overvoltage protected volt-ohm input. This protection applies for any function and range selected.

1-7. Several options and accessories are available for use with the 8000A. The options are listed and described in Table 1-1, and option compatibility is defined in Table 1-2. Desired options must be specified at time of purchase. The accessories are listed and described in Table 1-3. Accessories are compatible with all options and can be ordered at time of purchase or after purchase. Detailed information concerning each option and accessory is given in Section 6 of this manual.

1-8. Input power for the 8000A is available in one-of-three versions. These are: 100 volts, 50 to 400 Hz; 115 volts, 50 to 400 Hz; and 230 volts, 50 to 400 Hz. The desired version must be specified at the time of purchase. Overall operation of the 8000A is the same for all versions of input power.

NOTE

Options –05 and –06 are incompatible with the 100 volt, 50 to 400 Hz version of the 8000A (See Table 1-1).

Table 1-1. 8000A OPTIONS AND LINE POWER COMPATIBILITY

OPTION	DESCRIPTION	AC LINE POWER VERSION 100	115	230
–01	Battery Pack	x	x	x
–02	Digital Printer Output	x	x	x
–05	10A Current Range	–	x	x
–06	Low Ohms Ranges (2 and 20 Ω)	–	x	x

x = Compatible
– = Incompatible

Table 1-2. OPTION COMPATIBILITY

OPTION	–01	–02	–05	–06
–01	☐	–	x	●
–02	–	☐	x	–
–05	x	x	☐	–
–06	●	–	–	☐

● = Compatible, if ordered at the same time
x = Compatible
– = Incompatible
☐ = Not Applicable

Table 1-3. 8000A ACCESSORIES

ACCESSORY MODEL NO.	DESCRIPTION
C80	Carrying Case, Vinyl (7″ x 9½″)
C86	Carrying Case, Molded Plastic (8½″ x 11″)
M00-100-714	Front Panel Dust Cover
M00-200-611	Rack Mounting Kit, Center
M00-200-612	Rack Mounting Kit, Left/Right
M00-200-613	Rack Mounting Kit, Side-By-Side
A80	Deluxe Test Lead Kit
80I-600	AC High Current Probe, Clamp-On (2A–600A)
80K-40	High Voltage Probe
80RF-1	High Frequency Probe (100 kHz to 600 MHz)
81RF	High Frequency Probe (100 kHz to 100 MHz)

1-9. SPECIFICATIONS

DC Voltage

Ranges	±199.9 mV, ±1.999V, ±19.99V, ±199.9V, ±1199V
Accuracy: 1 year, 15°C to 35°C	±(0.1% of reading +1 digit)
Input Impedance	10 Megohms, all ranges
Normal Mode Rejection	Greater than 60 dB @ 50 Hz, 60 Hz
Common Mode Rejection (1 kΩ unbalance)	Greater than 120 dB @ dc and 50 Hz, 60 Hz
Response Time	500 ms
Maximum Input Voltage	1200V dc or 1200V rms (sinusoidal)

AC Voltage

Ranges	199.9mV, 1.999V, 19.99V 1199V
Accuracy: 1 year, 15°C to 35°C	45 Hz to 10 kHz ±(0.5% +2 digits) 10 kHz to 20 kHz ±(1% +2 digits)
Input Impedance	10 megohms in parallel with 100 pf
Common Mode Rejection (1 kΩ unbalance)	Greater than 60 dB @ 50 Hz, 60 Hz
Response Time (within one range)	3 seconds, worst case
Maximum Input Voltage	1200V rms (sinusoidal), not to exceed 10^7 volts - Hz product on 20, 200, 1200V ranges, 500V rms (sinusoidal) on 200mV and 2V ranges

Direct Current

Ranges	±199.9μA, ±1.999mA, ±19.99 mA, ±199.9 mA, ±1999mA
Accuracy: 1 year, 15°C to 35°C	±(0.3% of reading +1 digit)
Voltage Burden	0.3V maximum on all ranges except 0.6V on 2000mA range
Response Time	500 ms
Maximum Input	2 Amps rms (fuse protected)

Alternating Current

Ranges	199.9μA, 1.999mA, 19.99mA, 199.9mA, 1999mA
Accuracy:	
1 year, 15°C to 35°C	45 Hz to 10 kHz ±(1.0% of reading +2 digits) except 2000 mA range 45 Hz to 3 kHz ±(1.0% of reading +2 digits) on 2000 mA
Voltage Burden	0.25V maximum on all ranges except 0.5V on 2000 mA range
Response Time (within one range)	3 seconds
Maximum Input	2 Amps rms (fuse protected)

Resistance

Ranges	199.9Ω, 1.999kΩ,19.99kΩ, 199.9kΩ, 1999kΩ,19.99MΩ	
Accuracy:		
1 year, 15°C to 35°C	200Ω, 2kΩ, 20kΩ,200kΩ, 2000kΩ ranges ±(0.2% of reading +1 digit) 20MΩ range ±(0.5% of reading +1 digit)	
Response Time	200Ω, 2kΩ, 20kΩ, 200kΩ, 2000kΩ ranges: 500 ms 20MΩ range: 4 seconds	
Current through Unknown	200Ω Range	1mA
	2kΩ Range	1mA
	20kΩ Range	100μA
	200kΩ Range	1μA
	200kΩ Range	1μA
	20MΩ Range	0.1μA
Maximum Input Voltage	200Ω and 2kΩ Ranges	130V rms
	20kΩ thru 20MΩ Ranges	250V rms

Temperature Coefficients (−10°C to 15°C and 35°C to 55°C)

DC V	±(0.01% reading/°C +.005% F.S./°C)
DC MA	±(0.015% reading/°C + 0.005% F.S./°C)
KΩ	±(0.015% reading/°C + 0.005% F.S./°C)
10 Meg	±(0.02% reading/°C + 0.005% F.S./°C)
AC V	±(0.01% reading/°C +0.005% F.S./°C)
AC MA	±(0.015% reading/°C + 0.005% F.S./°C)

Environmental

Operating Temp. Range	−10°C to +50°C
Storage Temp. Range	−40°C to +70°D (−40°C to +60°C with Option −01)
Humidity Range	0 to 80% RH
Shock and Vibration	Meets requirements of MIL-T-21200K and MIL-E-16400F

General

Maximum Common Mode Voltage	1200V peak
Display	7-segment LED, 0.25″ character height
Size (inches)	2.52 high x 8.55 wide x 9.9 deep (see outline drawing Figure 1-1)
Weight	2¾ lbs. (1,2Kg) without batteries, 4 lbs. (1,8Kg) with Option −01)
Power	100-115-230V ac, 50 to 400 Hz, 2 watts

Battery Pack, Option −01

Continuous Operation	8 hours minimum
Charge Time	≈ 13 hours
Battery Life	300 to 500 charge-discharge cycles

Digital Printer Output Unit, Option −02

Data Available	Polarity, Overload, Digits and Overrange Bit
Flag	Busy (modifiable to Ready)
Control Inputs	Continuous Update and Data Update
Output Logic Levels	Logic 1 = 4.3 to 5.7 volts thru 15 kΩ pullup (modifiable to 15 volts maximum) Logic 0 = 0 to 0.4 volts, will sink 10mA
Printer Reference	5 volts thru 15 kΩ for reference high
Miscellaneous	TTL compatible and buffered outputs

10 Ampere Current Range, Option −05

DIRECT CURRENT

Ranges	±10.00A (1 min. operation from 10A to 20A)
Accuracy (1 year, 15°C to 35°C)	±(0.5% of reading +1 digit)
Voltage Burden	0.5V 0.5V @ 10A plus I · R drop of test leads
Response Time	500 ms

Maximum Input	20A (not fused)
Operating Time	10A and below, continuous Above 10A, 1 minute Max (Duty cycle 25%)

ALTERNATING CURRENT

Ranges	10.00A (1 min. operation from 10A to 20A)
Accuracy (1 year, 15°C to 35°C)	45 Hz to 3 kHz ±(1% of reading +2 digits)
Voltage Burden	0.5V maximum up to 10A
Response Time	3 seconds, worst case
Maximum Input	20A (not fused)
Operating Time	10A and below continuous Above 10A, 1 minute max. (Duty cycle 25%)

Low Ohms Ranges, Option —06

Ranges	1.999Ω, 19.99Ω, 199.9Ω, 1.999kΩ, 19.99kΩ, 199.9kΩ, 1999kΩ, (Note: the 19.99MΩ range has been removed to provide 2Ω and 20Ω function selection.)
Accuracy (1 year, 15°C to 35°C)	±(0.2% of reading +1 digit) all ranges except: ±(0.5% of reading +2 digits) on 20Ω range and ±(1% of reading +2 digits) on 2Ω range, 2Ω and 20Ω accuracy assumes lead resistance zeroed with front panel control
Response Time	500ms, all ranges
Current Through Unknown	2Ω range, 10 mA - 20Ω range, 10 mA
Maximum Input Voltage	2Ω through 2 kΩ ranges 130V rms (Note: Separate input for 2Ω and 20Ω ranges) 20 kΩ through 2000K ranges 250V rms.
Temperature Coefficient (2Ω and 20Ω)	±0.03/°C of input (assumes lead resistance zeroed with front panel control)
Max. Common Mode Voltage	500V peak

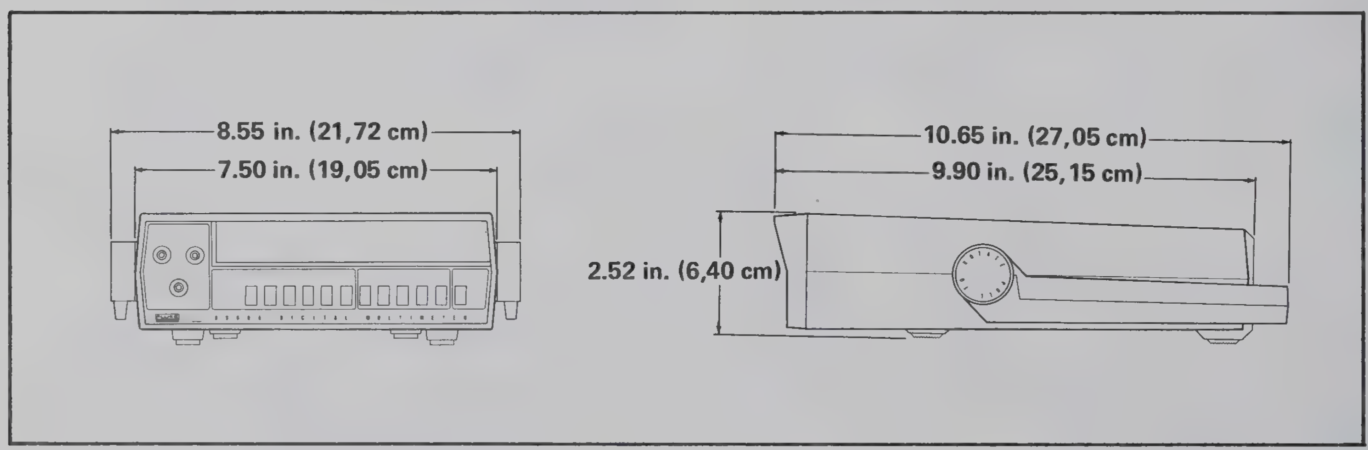


Figure 1-1. 8000A OUTLINE DRAWING

Section 2

Operating Instructions

2-1. INTRODUCTION

2-2. This section of the manual contains information regarding installation and operation of the Model 8000A DMM. It is recommended that the contents of this section be read and understood before any attempt is made to operate the instrument. Should any difficulties arise during operation, please contact your nearest John Fluke Sales Representative, or the John Fluke Mfg. Co., Inc., P.O. Box 43210, Mountlake Terrace WA, 98043, Tel.(206) 774-2211. A list of Sales Representatives is located in Appendix C of this manual.

2-3. SHIPPING INFORMATION

2-4. The 8000A is packaged and shipped in a foam-packed container. Upon receipt of the instrument, a thorough inspection should be made to reveal any possible shipping damage. Special instructions for inspection and claims are included in the shipping carton.

2-5. If reshipment of the instrument is necessary, the original container should be used. If the original container is not available, a new container can be obtained from the John Fluke Mfg. Co., Inc. Please reference the instrument model number when requesting a new shipping container.

2-6. INPUT POWER

2-7. The 8000A is factory wired to operate from one-of-three ac line voltages. These are: 100V ac, 50 to 400 Hz; 115V ac, 50 to 400 Hz; and 230V ac, 50 to 400 Hz. Before connecting the 8000A to the ac line, check to insure that the instrument is wired to accomodate the local line voltage. A decal on the underside of the 8000A specifies the particular line voltage required to operate the instrument.

2-8. The rear panel power input connector is a three-prong, U-ground connector which permits the instrument to be connected, via the power cord, to the appropriate line power. The offset prong on this connector is connected to the 8000A power supply, and should be connected, via the power cord, to a high quality earth ground.

2-9. RACK INSTALLATION

2-10. The 8000A is designed for either bench-top use or for installation in a standard 19-inch equipment rack using an optional accessory rack mounting kit. Rack mounting kits are available for left, right, center, or side-by-side mounting of the 8000A. Information regarding installation of the rack-mounting accessories is given in Section 6 under Rack Installation.

2-11. OPERATING FEATURES

2-12. The location of all 8000A controls, indicators and connectors are shown in Figure 2-1, and described in Table 2-1.

2-13. OPERATING NOTES

2-14. The following paragraphs describe various conditions which should be considered before operating the 8000A.

2-15. Option Information

2-16. Supplementary information is necessary when operating an 8000A which is equipped with one or more options. Detailed information regarding the operation of each available option is given in Section 6, Options and Accessories.

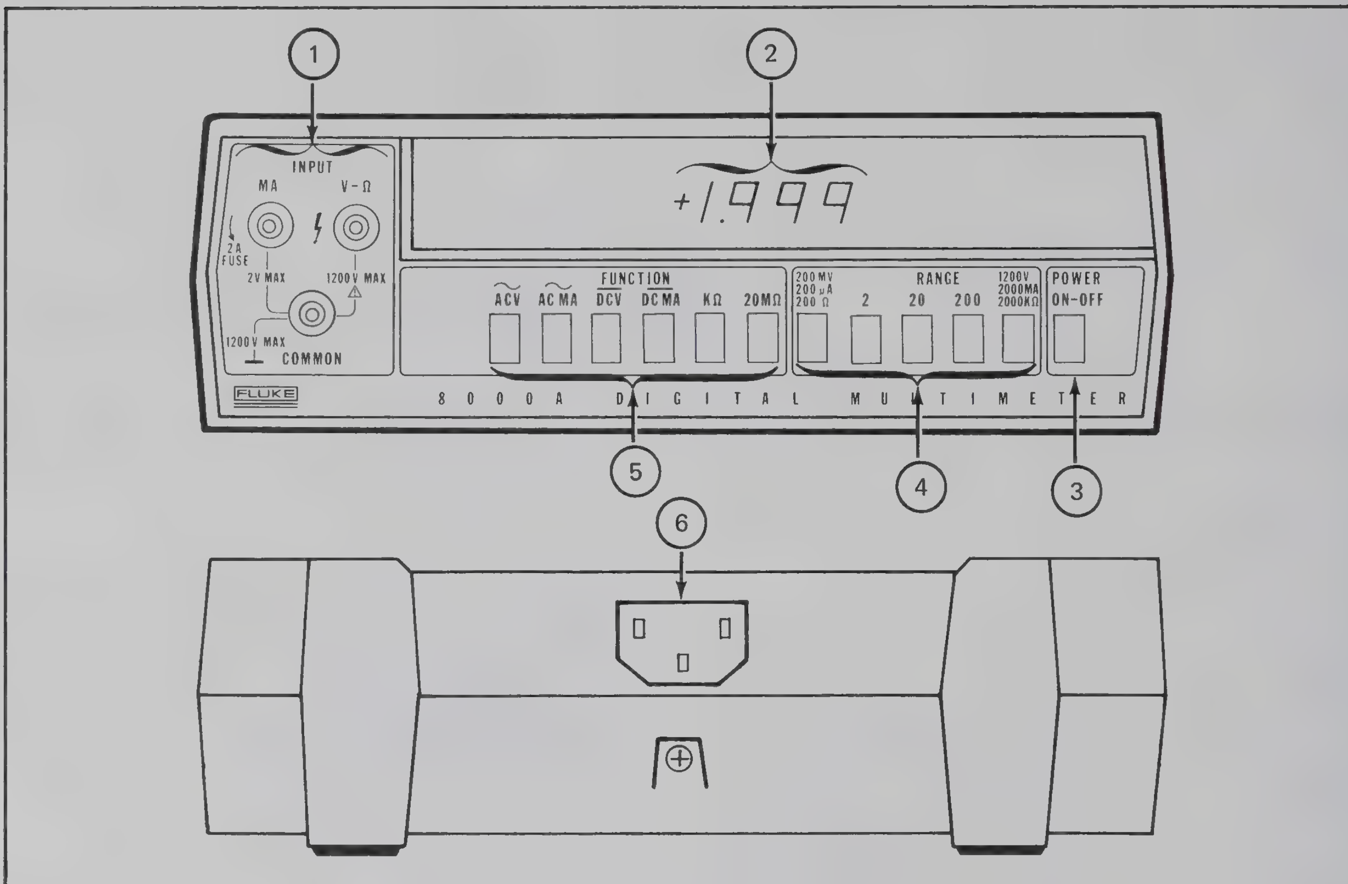


Figure 2-1. 8000A CONTROLS, INDICATORS AND CONNECTORS

Table 2-1. 8000A CONTROLS, INDICATORS AND CONNECTORS

FIG. 2-1 REF. NO.	NAME	FUNCTION
1	INPUT Connectors	Provides the input connections necessary to make current (MA), voltage (V), or resistance (Ω) measurements. All measurements are referenced to the COMMON INPUT connector.
2	Digital Readout	Provides a 3½ digit display (1999 maximum) of the measured input. The readout also includes a properly positioned decimal point, and a + or − sign for dc voltage and current measurements.
3	POWER Switch	Switches the 8000A on or off. The instrument is turned-on when the switch is depressed.
4	RANGE Switches	Provide pushbutton selection of one-of-five ranges which correspond to the selected function (current, voltage, or resistance). The available ranges are: Voltage: 200 MV, 2, 20, 200 and 1200V Current: 200μA, 2, 20, 200 and 2000 MA Resistance: 200Ω, 2, 20, 200 and 2000kΩ
5	FUNCTION Switches	Provide pushbutton selection of one-of-six measurement functions; ACV, AC MA, DCV, DC MA, KΩ, or 20MΩ.
6	Input Power Connector	Provides the means of connecting the instrument through the power cord to the ac power line.

2-17. Fuses

2-18. The 8000A is equipped with a line power fuse, and a current overload fuse for the current measuring function. The line fuse is located near the transformer on the inside of the instrument. To gain access, remove the retaining screw on the rear of the case and remove the instrument from the case. When replacement is necessary, use an AGC 1/8A fuse. The current input fuse is located behind the front-panel MA INPUT terminal, and is accessed by turning (ccw) and removing the MA INPUT terminal. Use a John Fluke 346940 replacement fuse.

2-19. Overrange Indication

2-20. The front panel display, in addition to providing a measurement reading, is designed to serve as an overrange indicator. When the full scale capability of the selected range for any function is exceeded, the display will blink while indicating a full scale reading. The presence of an overrange indication does not necessarily mean that the instrument is being exposed to a damaging input condition.

2-21. Input Overload Protection ⚠

CAUTION

Exceeding the maximum input overload conditions can damage the 8000A. Read Tables 2-2 and 2-3 before attempting to operate the instrument.

2-22. Each range and function of the 8000A is equipped with input overload protection. The maximum allowable input overload conditions for each function and range are given in Table 2-2.

2-23. OPERATION

2-24. Use the following procedure for initial turn-on of the 8000A:

a. Connect the instrument to ac line power. (See Paragraph 2-6)

b. Depress the POWER switch.

c. In accordance with Table 2-3, select the desired function and range; connect the test leads to the corresponding input connectors.

NOTE

Supplemental instructions may be required for instruments with options installed. These instructions, if any, are given in Section 6, Options and Accessories.

Table 2-2. 8000A MAXIMUM ALLOWABLE INPUT OVERLOAD CONDITIONS

SELECTED FUNCTION	SELECTED RANGE	MEASUREMENT INPUT CONNECTIONS	MAXIMUM INPUT OVERLOAD LIMITS
DC V	200MV, 2, 20, 200, or 1200V	V-Ω and COMMON	1200V dc or 1200V rms (sinusoidal)
DC MA	200μA, 2, 20, 200, or 200MA	MA and COMMON	① 2A (Fuse Protected)
AC V	20, 200 or 1200V	V-Ω and COMMON	1200V rms (sinusoidal), not to exceed 10^7 V - Hz
	200MV or 2V	V-Ω and COMMON	500V rms (sinusoidal)
AC MA	200μA, 2, 20, 200 or 2000MA	MA and COMMON	① 2A (Fuse Protected)
KΩ	200Ω or 2	V-Ω and COMMON	130V rms
	20, 200 or 2000KΩ	V-Ω and COMMON	250V rms
20MΩ	Not Applicable	V-Ω and COMMON	250V rms
Any	Any	Earth Ground and COMMON	1200V peak

① When measuring currents from sources having compliance voltages greater than 32 volts, replace the 2A current fuse with one of the required rating. (Later production instruments are equipped with a 250 - volt, 2A current fuse.)

Table 2-3. 8000A MEASUREMENT INSTRUCTIONS

DESIRED MEASUREMENT	SELECT FUNCTION	SELECT RANGE	MEASUREMENT INPUT CONNECTIONS
DC Volts	DC V	200MV, 2, 20, 200 or 1200V	V-Ω and COMMON
① DC Milliamperes	DC MA	200μA, 2, 20, 200 or 2000MA	MA and COMMON
AC Volts	AC V	200MV, 2, 20, 200 or 1200V	V-Ω and COMMON
① AC Milliamperes	AC MA	200μA, 2, 20, 200 or 2000MA	MA and COMMON
Kilohms	KΩ	200Ω, 2, 20, 200 or 2000KΩ	V-Ω and COMMON
Megohms	20MΩ	Not Applicable	V-Ω and COMMON

① To accommodate unusually high compliance voltages during current measurements, it may be necessary to use an externally-connected 1.5A (max.) fuse of the required voltage rating.

Section 3
Theory of Operation

3-1. INTRODUCTION

3-2. This section of the manual contains a simplified block diagram analysis followed by circuit description of the Model 8000A DMM. Simplified block diagrams and circuit diagrams are included, as necessary, to supplement the text. Schematic diagrams are included in Section 7 of this manual.

3-3. SIMPLIFIED BLOCK DIAGRAM ANALYSIS

3-4. Introduction

3-5. The 8000A, as shown in the simplified block diagram of Figure 3-1, can be divided into three major sections; the Input Signal Conditioner, the Analog-to-Digital (A/D) Converter, and the Front Panel Display. Each section is discussed separately in the following paragraphs.

3-6. Input Signal Conditioner

3-7. The function of the Input Signal Conditioner is to condition the applied input, according to the selected function, and to provide a scaled dc output voltage which is proportional to the applied input. The output voltage will be from 0 to ±0.2V dc, or 0 to ±2.0V dc depending on range selected. The RANGE switches, located in the Input Divider and Current Shunt circuits, scale the input signal to a level which is acceptable for the selected function. The FUNCTION switches place the Signal Conditioner in the configuration necessary to process the input signal.

3-8. A/D Converter

3-9. The A/D Converter changes the analog dc output voltage of the Signal Conditioner into a digital representation. This is accomplished in two stages using a voltage-to-frequency converter (Analog IC) and a digital counter/processor (Digital IC). The A/D Converter also controls the measurement and display period of the 8000A.

3-10. Display

3-11. The Display section of the 8000A accepts digital information from the A/D converter, and converts it into a visual, numeric presentation which corresponds to the value of the applied input signal. The display is updated at a rate governed by the A/D converter.

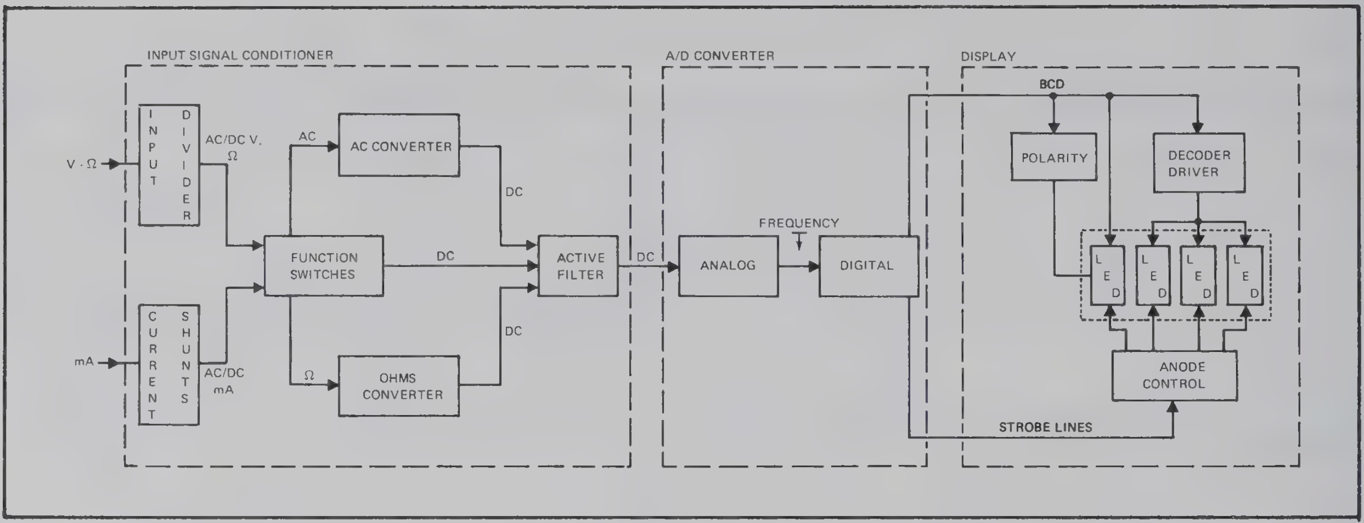


Figure 3-1. MODEL 8000A BLOCK DIAGRAM

3-12. CIRCUIT DESCRIPTION

3-13. The following circuit descriptions are keyed to the functional blocks defined in the simplified block diagram of Figure 3-1. Corresponding functional blocks are defined in the detailed schematics in Section 7. Refer to the schematics while reading the following circuit descriptions.

3-14. Signal Conditioning

3-15. INPUT VOLTAGE DIVIDER

3-16. Three series connected resistors (R1, R2 and R3) totaling 10 megohms are tapped to provide division ratios of 100 or 1000 to 1. The 20 and 200V ranges use the 100:1 tap, and the 1200V range uses the 1000:1 tap.

3-17. Trimming capacitors are connected across the Input Voltage Divider to maintain a flat frequency response when used for ac voltages. High frequency compensation during calibration can be accomplished with variable trimmer capacitor C3.

3-18. CURRENT SHUNTS

3-19. The current shunts consist of resistors R44 through R48. Series-connected resistors R44 through R47 are switched into the circuit, depending upon the RANGE selected. The resistor steps are 1000, 100, 10, and 1 ohms for the 0.2, 2, 20, and 200 milliampere ranges, respectively. A separate 100 milliohm four terminal shunt is used for the 2000MA range.

3-20. The maximum voltage developed across a single shunt or combination of shunts for full range indication is 0.2 volts. Current overload protection above 2 amperes is provided by fuse F2. The shunts are protected against over-voltage by diodes CR9 through CR12.

3-21. AC CONVERTER

3-22. The AC Converter consists of a buffer and an active rectifier (refer to Figure 3-2). Transistor Q1, connected as a voltage follower, operates as a buffer for the active rectifier. The buffer output is applied as a voltage, e_{in} to the non-inverting input of the operational amplifier. Negative feedback causes the voltage at the inverting input to follow the non-inverting input, causing a current, $e_{in}/R2$, through R2 to ground. Since diodes CR1 and CR2 conduct on alternate half cycles, one-half the average current flows through R1. The rectified voltage developed across R1 is filtered by R3 and C1 to produce the dc voltage required for the A/D Converter.

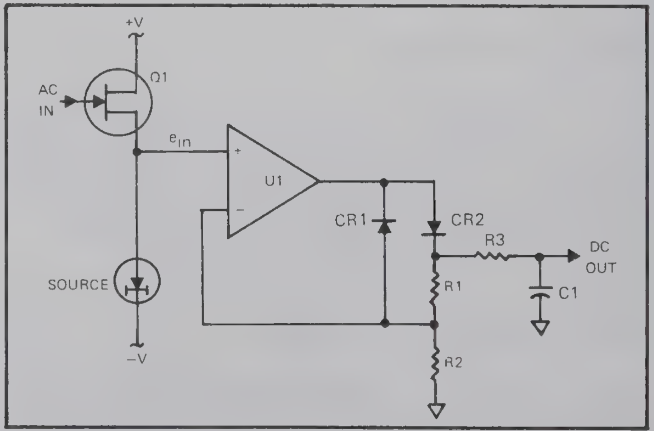


Figure 3-2. AC CONVERTER SIMPLIFIED DIAGRAM

3-23. The input to the AC Converter is in either the 0.2 volt or 2 volt basic range. To accommodate either range, the gain of the operation rectifier is adjusted accordingly by changing the feedback resistor (symbolized by R1). In the instrument, R51 sets the gain at unity for the 2 volt basic range. For the 0.2 volt basic range, the gain is increased by 10 by switching R50 in parallel with R51.

3-24. OHMS CONVERTER

3-25. The Ohms Converter supplies a dc voltage, proportional to the unknown resistance (R_X), to the A/D Converter. A simplified diagram of the circuit elements involved is illustrated in Figure 3-3. Operational Amplifier U2 bootstraps the current source. With the non-inverting input connected to the junction of R_A and R_X, current will flow through R_A and R_X such that a constant voltage is maintained across R_A for a given RANGE. If R_X is within the range selected, the voltage developed will be proportional to the value of R_X. For resistance ranges 200 ohms through 2000 kilohms, the constant voltage maintained is 10 volts. In the 20 megohm range, U2's feedback resistor, R_F, is changed so that a 1 volt potential is maintained.

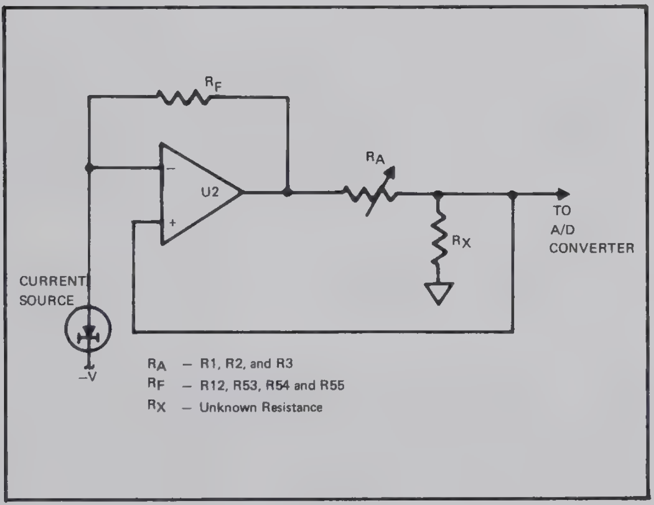


Figure 3-3. OHMS CONVERTER SIMPLIFIED DIAGRAM

3-26. ACTIVE FILTER

3-27. The Active Filter ensures that the input to the A/D Converter receives only dc voltages. The operational amplifier (U2) used for the Ohms Converter is also used in conjunction with R18, C11, R19, and C12 to form a two-pole Bessel-type active filter (see Figure 3-4). A cutoff frequency of 10 Hz and a 60 Hz rejection ratio of 32 db is provided by this filter. Normal mode rejection at frequencies other than even multiples of the integration period is also provided. Overloading of the A/D Converter by large ripple voltages is prevented by the filter.

3-28. Analog-to-Digital Converter

3-29. GENERAL

3-30. The A/D Converter uses a voltage-to-frequency conversion technique. A dc voltage at the input of the A/D Converter is changed to a frequency by the Analog Integrated Circuit. This frequency is characteristic of the magnitude and polarity of the dc input voltage. Counting of the output frequency from the Analog IC is accomplished by the Digital IC. The resultant count is transferred (in binary coded decimal format) to the display section.

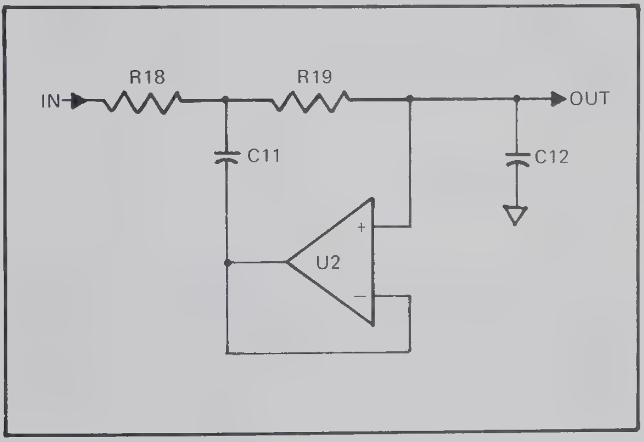


Figure 3-4. ACTIVE FILTER SIMPLIFIED DIAGRAM

3-31. ANALOG IC

3-32. The Analog IC is an LSI device which contains a two-input multiplexer, an amplifier, and a voltage controlled oscillator (VCO). In operation, the Analog IC samples between a reference voltage (0 V dc) and the output of the Active Filter (0 to ±.2 or 0 to ±2V dc) to provide two separate output frequencies. The difference between the two frequencies is an accurate digital representation of the input voltage. This A/D conversion technique automatically eliminates the zero-offset errors which are in-

herent in many A/D converters. For example, if the VCO rest frequency is ≈ 40 kHz during the reference sample and a 0V dc input is present during the voltage sample, the output of the VCO does not change. No change is equal to 0V dc. Therefore, as long as the oscillator does not drift during the two sample periods a zero-offset error cannot exist.

3-33. The range resistor, in Figure 3-5, symbolizes the dual range capability of the Analog IC. This resistance, external to the IC, consists of series resistors R23, R57, R25 and R58. When the instrument is in the 2 volt basic range, all four resistors are used to scale the current to the V/F Converter. Variable resistor R25 is the calibration adjustment for this range. For operation in the 0.2 volt basic range, the switching provides a short across R25 and R58. Therefore, only resistor R57 and calibration adjustment R23 scale the current to the proper level for the V/F Converter.

3-34. Timing circuitry for the A/D Converter is contained in the Analog IC. The connection between the Analog IC and the Digital IC is through R41, Q6, R56, and adjustment R20. Overload protection for the Analog IC is provided by transistors Q20 and Q21. Negative overload voltages are handled by Q20 and positive overloads by Q21.

3-35. DIGITAL IC

3-36. The output from the Analog IC alternates between the rest frequency during one time period, and a frequency corresponding to the A/D Converter input voltage during the next time period. Reversible counters in the Digital IC count these frequencies such that their difference is used to provide the bcd measurement information.

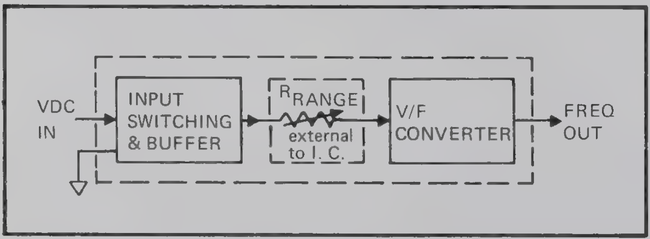


Figure 3-5. ANALOG IC BLOCK DIAGRAM

3-37. A four-line bcd output (W-X-Y-Z on schematic) and a four-line strobing pulse output (S1-S2-S3-S4 on schematic) are provided by the Digital IC to the Display section. The bcd lines W-X-Y-Z correspond to binary 8-4-2-1 positions, respectively.

3-38. Display

3-39. POLARITY

3-40. The polarity indicator consists of horizontal and vertical LED segments of DS1. These segments are strobed during the S1 time period, when the instrument is in the DCV or DC MA function. The horizontal segment is used alone for a negative indication, and together with the vertical segment to build a positive indication. Consequently, the horizontal segment must illuminate during each S1 time period. This is accomplished by S3D (DCV) or S4C (DC MA) which ground the cathodes of the horizontal LED segment. Illumination of the vertical segment relies upon the digital information provided by the Y bcd line during S1 time. When a positive voltage or current is applied to the INPUT terminals, the Y line goes high. This turns on Q8 and Q10 which allow the vertical segment to illuminate. With the Y line low Q8 and Q10 are cut off and the vertical segment does not illuminate.

3-41. DECODER DRIVER

3-42. The Decoder Driver, U5, translates the bcd information on the W-X-Y-Z lines for application to the LED readouts DS2, DS3, and DS4. Low inputs are provided by the Decoder Driver through a resistor network RN1 to the LED segments for construction of decimal numbers.

3-43. DECIMAL POINT

3-44. The LED readouts DS2, DS3, and DS4 contain a decimal point which is controlled by the RANGE switches. The selected range causes the resistor network RN2 to supply a negative voltage to the cathode of the decimal segment. Note on the schematic that the 20MΩ FUNCTION, which requires no range selection, shares the 20 RANGE decimal point of DS2.

3-45. ANODE CONTROL

3-46. The Anode Control circuit, Q11 through Q18 applies +5V dc to the anodes of the LED readouts. Strobe

pulses from the Digital IC determine which readout receives the proper anode voltage at a particular time. The strobe pulse sequence is S1-S3-S2-S4, yielding a display sequence of DS1-DS3-DS2-DS4. For example: when S2 goes high, Q12 and Q16 turn-on and apply approximately +5V dc to the anodes of the LED segments on DS2. Those segments with negative voltages on their cathodes, at S2 time, will illuminate and form a decimal number.

3-47. LED READOUTS

3-48. The LED readouts DS2, DS3, and DS4 each contain 7½ diode segments. One-half of a segment for a decimal point and seven segments to form decimal numbers. The segments are designated A through G for each readout on the schematic.

3-49. Readout DS1 indicates the most significant digit (MSD) and polarity. Two segments form a numerical "1" and two segments to form the polarity signs. Control of the MSD "1" indication is separate from the other readouts. The bcd information is produced on the Z line during the S1 time period. When line Z is high during time S1, Q7 and Q9 turn on to allow the "1" segment to illuminate.

3-50. Power Supply

3-51. The power supply, shown in the schematic diagram, provides ±15 and +5V dc outputs. Diode bridge CR15 through CR18 and filter capacitors C17 and C18 supply the unregulated ±15V dc. Diodes CR13 and CR14, and filter capacitor C19 supply the unregulated +5V dc.

Section 4
Maintenance

4-1. INTRODUCTION

4-2. This section of the manual contains maintenance information for the Model 8000A DMM. This includes service information, general maintenance, performance test, calibration and troubleshooting. The performance test is recommended as a preventative maintenance tool, and should be executed when it is necessary to verify proper instrument operation. A calibration interval of one year is recommended to insure that the 8000A is within the one-year specifications. Troubleshooting information is given in the form of flow charts at the end of this section. Table 4-1 lists the recommended test equipment necessary to maintain the 8000A. If the specified equipment is not available, other equipment having equivalent specifications may be used.

4-3. The Model 8000A DMM is warranted for a period of one year upon delivery to the original purchaser. The WARRANTY is given on the back of the title page located in the front of this manual. For the WARRANTY to become effective, the validation card included with the instruction manual must be completed and returned to the John Fluke Mfg. Co., Inc.

4-4. A unique 48-hour turnaround service is provided for the 8000A. Should your instrument need repair, send it to the nearest authorized service center. A complete list of service centers is included with the WARRANTY. Shipping information is given in Section 2 of this manual. If requested, an estimate will be provided to the customer before work is begun on instruments that are beyond the warranty period.

Table 4-1. RECOMMENDED TEST EQUIPMENT

EQUIPMENT NOMENCLATURE	SPECIFICATIONS	RECOMMENDED EQUIPMENT
DC Voltage Source	190mV to 1200V ±0.03%	Fluke Model 341A
DC Current Source	190μA to 1.9A ±0.1%	Fluke Model 382A
AC Voltage Source	190mV to 1200V (45Hz to 10 kHz) ±0.1%	Fluke Models 5200A/5205A
	190mV to 1200V (10 kHz to 20 kHz) ±0.2%	
AC Current Source	190μA to 190mA (100 Hz to 10 kHz) ±0.3%	Optimation AC 105, and Fluke Models 540B, 382A, A45, and A40 shunts (20mA, 200mA, and 2A)
	1.9A (100 Hz to 3 kHz) ±0.3%	
Resistors	190Ω, 1.9kΩ, 19kΩ, 1.9MΩ and 19MΩ ±0.1%	
Frequency Counter	To measure positive 100 msec. pulse with 1μsec resolution	Fluke Model 1952B
Oscilloscope	General Purpose	Tektronix 545B W/1A1 plug-in

4-5. GENERAL MAINTENANCE

4-6. Access Information

4-7. Use the following procedure to gain access to the interior of the 8000A:

a. Set the POWER switch to off, and disconnect the line cord.

b. Remove the phillips screw at the rear of the instrument case.

c. Separate the instrument from the case.

4-8. Cleaning

4-9. Clean the 8000A periodically to remove dust, grease and other contamination. Use the following procedure:

CAUTION

Do not use aromatic hydrocarbons or chlorinated solvents to clean the 8000A. They will react with the plastic materials used in the instrument.

a. Clean the surface of the pcb using clean dry air at low pressure ($\leqslant$ 120 psi). If grease is encountered, spray with Freon T.G. Degreaser and remove grime with clean dry air at low pressure.

b. Clean the front panel and case with a soft cloth dampened with a mild solution of detergent and water.

4-10. Fuse Replacement

4-11. The input power fuse F1 is located on the interior of the instrument near the power transformer. If replacement is necessary, use an AGC 1/8A fuse (Use MDL 1/8A for battery powered instruments).

4-12. The current shunt protection fuse F2, is located behind the front panel MA INPUT connector. To remove the fuse, turn the MA INPUT connector ccw and pull it out. Use a John Fluke 346940 replacement fuse.

4-13. Service Tools

4-14. No special tools are required to maintain or repair the 8000A.

4-15. PERFORMANCE TEST

4-16. The performance test is designed to verify the overall operation of the 8000A. The test can be used as an acceptance check and/or periodic maintenance check. Table 4-1 lists the equipment required to perform this test. If the 8000A fails any part of the performance test, corrective action is indicated. Troubleshooting information for fault isolation is given later in this section.

NOTE

The performance test should be performed at an ambient temperature of +22 to +25°C and at a relative humidity of less than 70%.

4-17. Zero Offset Test

4-18. Use the following procedure to test the zero offset of the 8000A:

a. Energize the instrument and depress the DCV and 200mV pushbuttons.

b. Place a shorting jumper between the V-Ω and COMMON input connectors. The readout should indicate 00.0, flashing $\pm$00.1 not more than 10 times in 10 seconds.

c. Remove the shorting jumper. The readout should indicate $\leqslant\pm$01.0.

4-19. Accuracy Test

4-20. The accuracy test compares the instruments performance to the accuracy specifications listed in Section 1. Use the following procedure to perform the accuracy test:

a. Set the 8000A FUNCTION and RANGE switches to AC MA and 2000 MA, respectively,

b. Connect the output of the ac current source to the MA and COMMON INPUT connectors of the 8000A.

c. Refer to Table 4-2. Sequentially select each range and apply the corresponding ac current at the frequency listed. Check to insure that the 8000A readout is within the limits shown.

d. Refer to paragraph 4-31, Range Adjustments/Checks, and check the accuracy of each of the remaining functions and ranges. Disregard the adjustment column of Table 4-3.

4-21. CALIBRATION

4-22. The 8000A should be calibrated at least once a year or whenever repairs have been made. Calibration should be accomplished at an ambient room temperature of +22 to +25°C, and at a relative humidity of less that 70%. Table 4-1 lists the required equipment.

4-23. Initial Procedure

4-24. Remove the case from the 8000A and energize the instrument.

WARNING !

The input power connector is at the ac line potential (100, 115 or 230V ac). Use caution when working in this area.

Table 4-2. AC MA PERFORMANCE CHECKS

RANGE	INPUT	DISPLAY LIMITS
200μA	190μA @ 100 Hz	187.9 to 192.1
200μA	190μA @ 10 kHz	187.9 to 192.1
2	1.9 mA @ 100 Hz	1.879 to 1.921
2	1.9 mA @ 10 kHz	1.879 to 1.921
20	19 mA @ 100 Hz	18.79 to 19.21
20	19 mA @ 10 kHz	18.79 to 19.21
200	190 mA @ 100 Hz	187.9 to 192.1
200	190 mA @ 10 kHz	187.9 to 192.1
2000 mA	1.9A @ 100 Hz	1879 to 1921
2000 mA	1.9A @ 3 kHz	1879 to 1921

4-25. Period Adjustment

4-26. Use the following procedure to adjust the 8000A measurement period:

a. Connect the frequency counter between TP5 and TP4 (common) as shown in Figure 4-1.

b. Set the frequency counter to the time interval operating mode.

c. Using an appropriate adjusting tool, adjust R20 (Period), shown in Figure 4-1, for a time period of 100 ms ±5μs. Variations of the time period should be ≤±15μs.

4-27. Zero Offset Adjustment

4-28. The zero offset adjustment procedure applies only to instruments which fall into the catagory of Use Code D. The used codes are keyed to the instrument serial numbers and are given in paragraph 5-7. Use the following procedure to adjust the zero offset.

a. Depress the DCV and the 200 mV pushbuttons.

b. Install a shorting jumper between the V-Ω and COMMON input connectors.

c. The readout should indicate 00.0, flashing ±00.1 not more than 10 times in 10 seconds. Adjust R15, if required, to meet these limits.

d. Remove the shorting jumper. The readout should indicate ≤±01.0.

4-29. Turn-Over Error Adjustment

4-30. Use the following procedure to adjust the turn-over error:

NOTE

Procedural steps noted with Use Code D apply only to instruments which fall into that catagory. The use codes are determined according to the instrument serial number and are listed in paragraph 5-7. Procedural steps which do not specify a use code apply to all 8000A's.

a. Depress the DCV and the 200 MV pushbuttons.

b. Connect a dc voltage source to the V-Ω and COMMON inputs. Set the supply for a +190 mV output.

c. Adjust R25 (see Figure 4-1) for a readout of +190.0.

d. Change the input voltage from +190 mV to −190 mV.

e. Readout should indicate −190.0 ±.1.

f. Use Code D only. If the instrument is not within limits adjust R15 to bring the instrument within the −190.0 ± .1 indication.

g. Use Code D only. Check and, if necessary, re-adjust the zero offset, paragraph 4-27.

4-31. Range Adjustment/Checks

4-32. The 8000A range adjustments are accomplished in accordance with the instructions given in Table 4-3. Perform each adjustment and/or check in the order listed. The shaded areas of the table separate the adjustments from the checks. Refer to Figure 4-1 for the location of the specified adjustment. The following test equipment from Table 4-1 is used to provide the input specified for each function.

a. DCV - DC Voltage Source

b. 20MΩ - Resistors

c. KΩ - Resistors

d. DC MA - DC Current Source

e. ACV - AC Voltage Source

4-33. TROUBLESHOOTING

4-34. The following information is designed to aid in troubleshooting the 8000A. Fault isolation is achieved by executing the performance test and isolating the problem to a functional circuit group using troubleshooting flow charts. The flow chart symbols are defined in Figure 4-2 and the troubleshooting flow charts are given in Figure 4-3.

4-35. If a component is found to be defective in either the Input Divider Resistor Set, the Analog Resistor Set, or the Ohms Resistor Set, the complete set must be replaced.

4-36. Replacement Analog IC's and Digital IC's are packed in conductive foam when shipped. To protect them from damage by static discharge, they should not be removed from the conductive foam until the time of installation. The personnel handling the devices, and the working surface must be grounded.

Table 4-3. 8000A ADJUSTMENTS AND CHECKS

FUNCTION/ RANGE	INPUT	ADJUSTMENT	DISPLAY LIMITS
DCV / 200 MV	+190 MV	"200 MVDC" (R23) Adjust for +190.0	+189.7 to +190.3
DCV / 2	+1.9V dc	"2 VDC" (R25) Adjust for +1.900	+1.897 to +1.903
DCV / 20	+19V dc	———————	+18.97 to +19.03
DCV / 200	+190V dc	———————	+189.7 to +190.3
DCV / 1200V	+1000V dc	———————	+998 to +1002
20MΩ	19MΩ	"20 M" (R55) Adjust for 19.00	18.89 to 19.11
KΩ / 20	19KΩ	"K OHM" (R12) Adjust for 19.00	18.95 to 19.05
KΩ / 200Ω	190Ω	———————	189.5 to 190.5
KΩ / 2	1.9KΩ	———————	1.895 to 1.905
KΩ / 200	190KΩ	———————	189.5 to 190.5
KΩ /2000KΩ	1.9MΩ	———————	1895 to 1905
DC MA / 200µA	+190µA	———————	+189.3 to +190.7
DC MA / 2	+1.9mA	———————	+1.893 to +1.907
DC MA / 20	+19mA	———————	+18.93 to +19.07
DC MA / 200	+190mA	———————	+189.3 to +190.7
DC MA / 2000 MA	+1.9A	———————	+1893 to 1907
ACV / 200 MV	190mV @ 100Hz	———————	188.8 to 191.2
ACV / 200 MV	190mV @ 20kHz	———————	187.9 to 192.1
ACV / 2	1.9V @ 100 Hz	———————	1.888 to 1.912
ACV / 2	1.9V @ 20kHz	———————	1.879 to 1.921
ACV / 20	19V @ 20kHz	"HF ADJ" (C3) Adjust for 19.00	18.79 to 19.21
ACV / 20	19V @ 10 kHz	———————	18.88 to 19.12
ACV / 200	190V @ 10 kHz	———————	187.9 to 192.1
ACV / 200	190 @ 20 kHz	———————	187.9 to 192.1
ACV / 1200V	1000V @ 100 Hz	———————	993 to 1007
ACV / 1200V	1000V @ 10 kHz	———————	988 to 1012

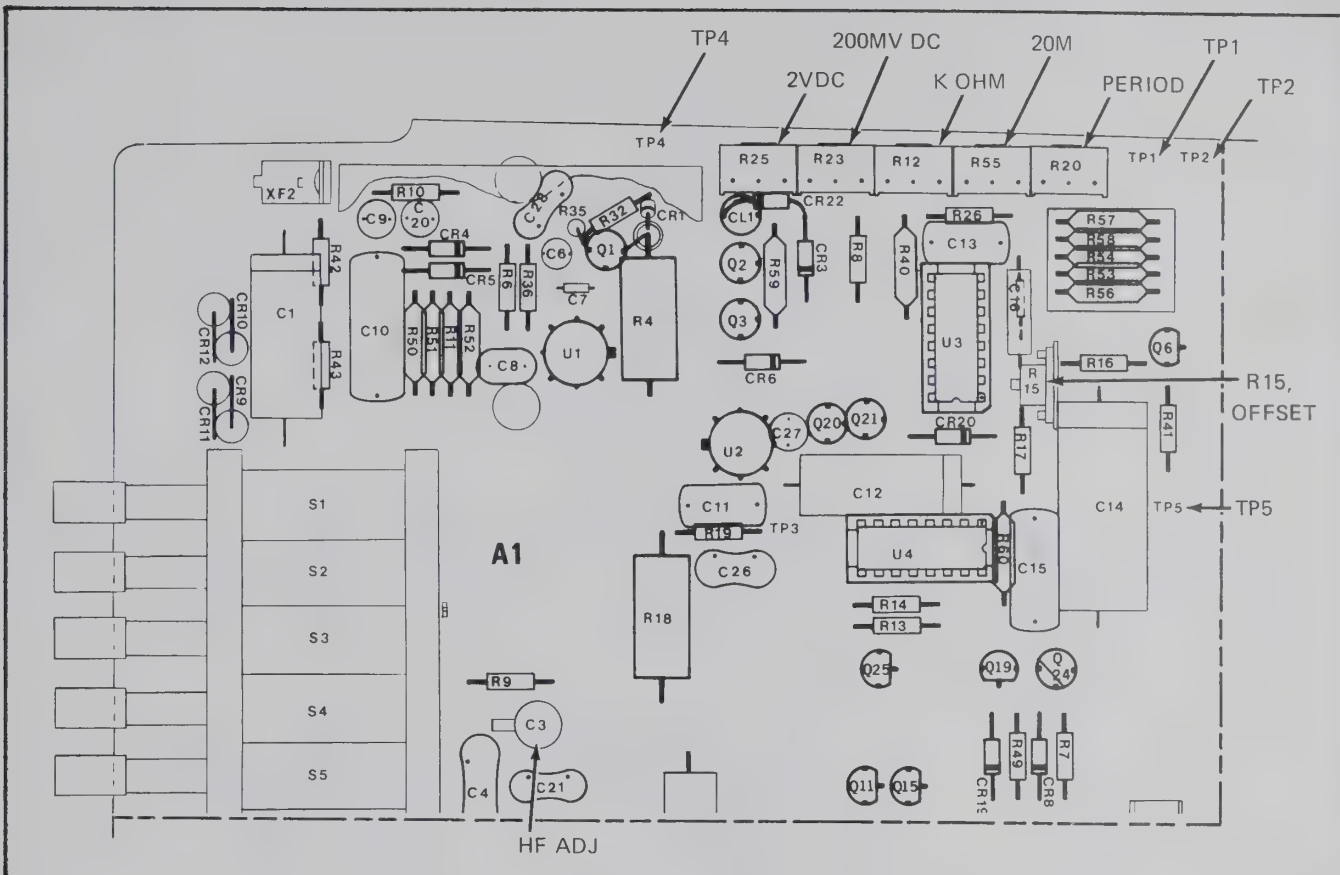


Figure 4-1. ADJUSTMENT AND TEST POINT LOCATIONS

↑	INTERCONNECTS FLOW CHART SYMBOLS AND INDICATES THE DIRECTION OF PROCEDURE FLOW.
START	A TERMINAL POINT – USED TO INDICATE A START, STOP OR INTERRUPT OF PROCEDURE FLOW.
MEASURE DC VOLTAGE ACROSS CAPACITOR C 1	INSTRUCTION OR PROCEDURAL STEP.
+12 TO +13 VDC ?	DECISION REQUIRED – ALWAYS ASK A QUESTION - THE FLOW FROM THE SYMBOL IS DEPENDENT UPON THE DECISION MADE – USUALLY YES (GO) OR NO (NO GO), BUT MAY HAVE THREE POSSIBILITIES (EG, HIGH, LOW, NORMAL).
SEE FIGURE 2 FOR THE LOCATION OF THE +5 VDC ADJUSTMENT, R8	ANNOTATION – PROVIDES ADDITIONAL INFORMATION FOR THE SYMBOL TO WHICH IT IS CONNECTED. ALWAYS CONNECTED BY A DASHED LINE.
101	CONNECTOR – EXIT TO, OR ENTRY FROM, ANOTHER PART OF THE FLOW CHART (ASSOCIATED ARROWHEAD SHOWS WHICH).
PERFORM REGULATION TEST	PREDEFINED PROCESS – INDICATES THAT THE PROCEDURE TO BE PERFORMED IS DESCRIBED ELSEWHERE.

Figure 4-2. TROUBLESHOOTING FLOW CHART SYMBOLS

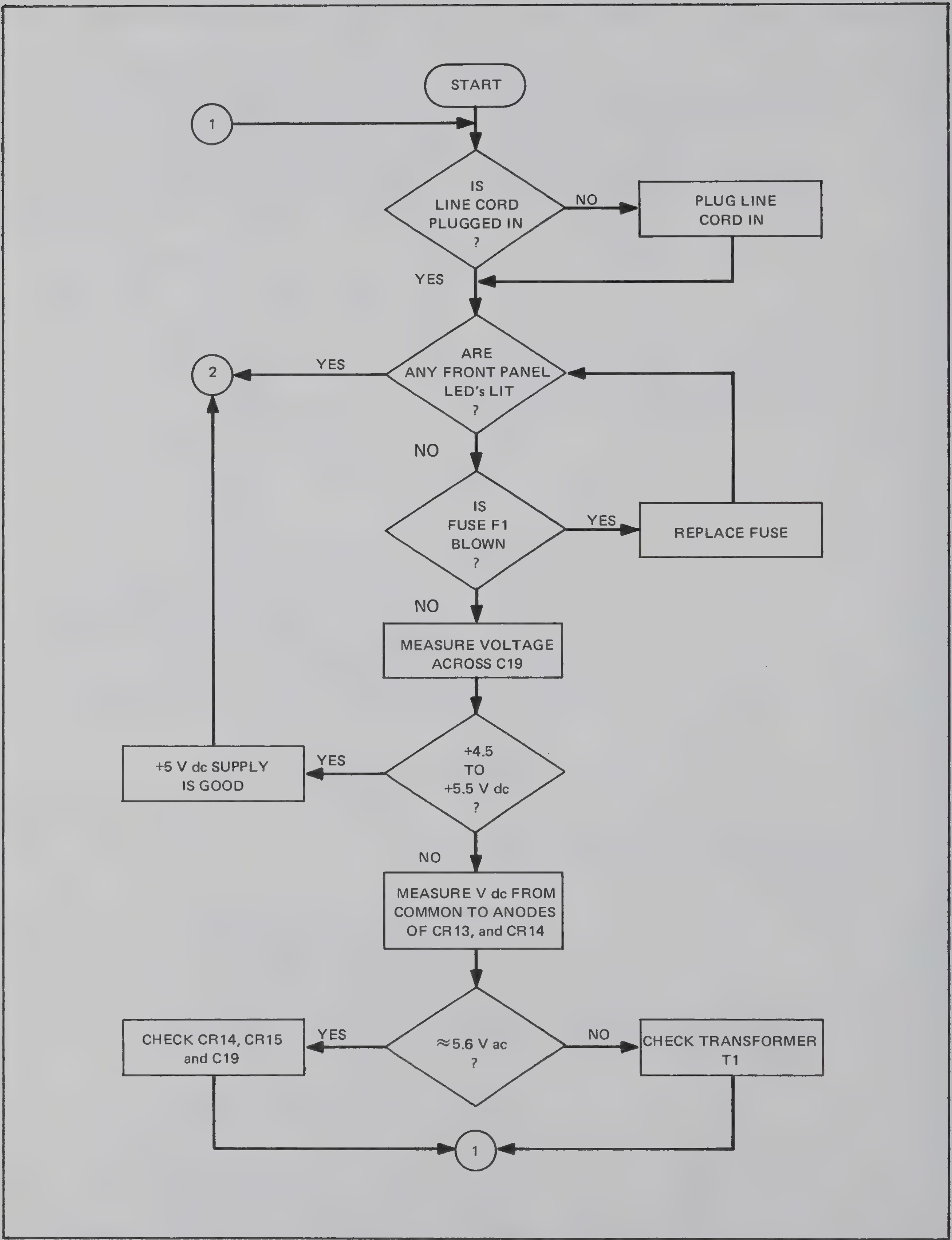


Figure 4-3. 8000A TROUBLESHOOTING FLOW CHART (Sheet 1 of 8)

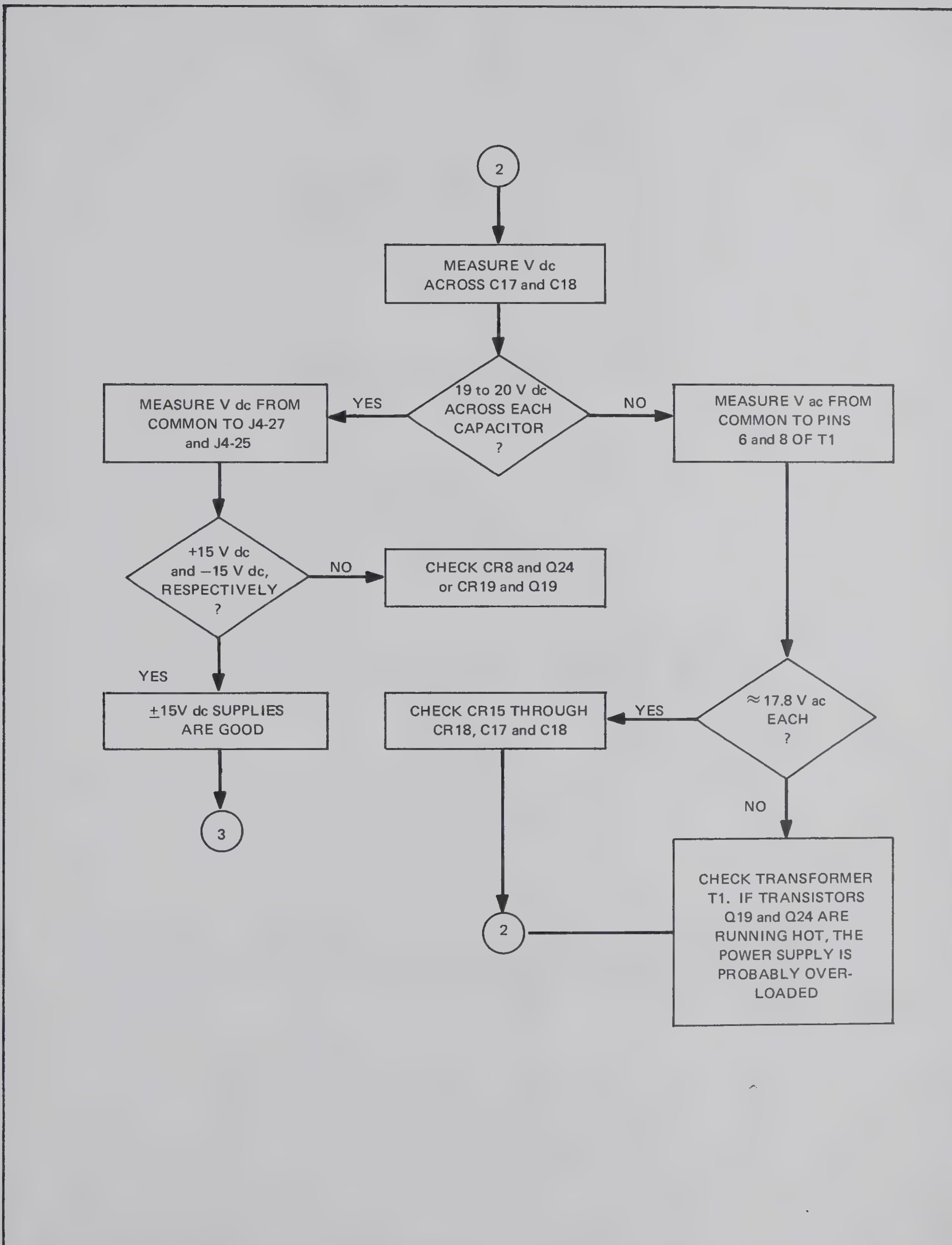


Figure 4-3. 8000A TROUBLESHOOTING FLOW CHART (Sheet 2 of 8)

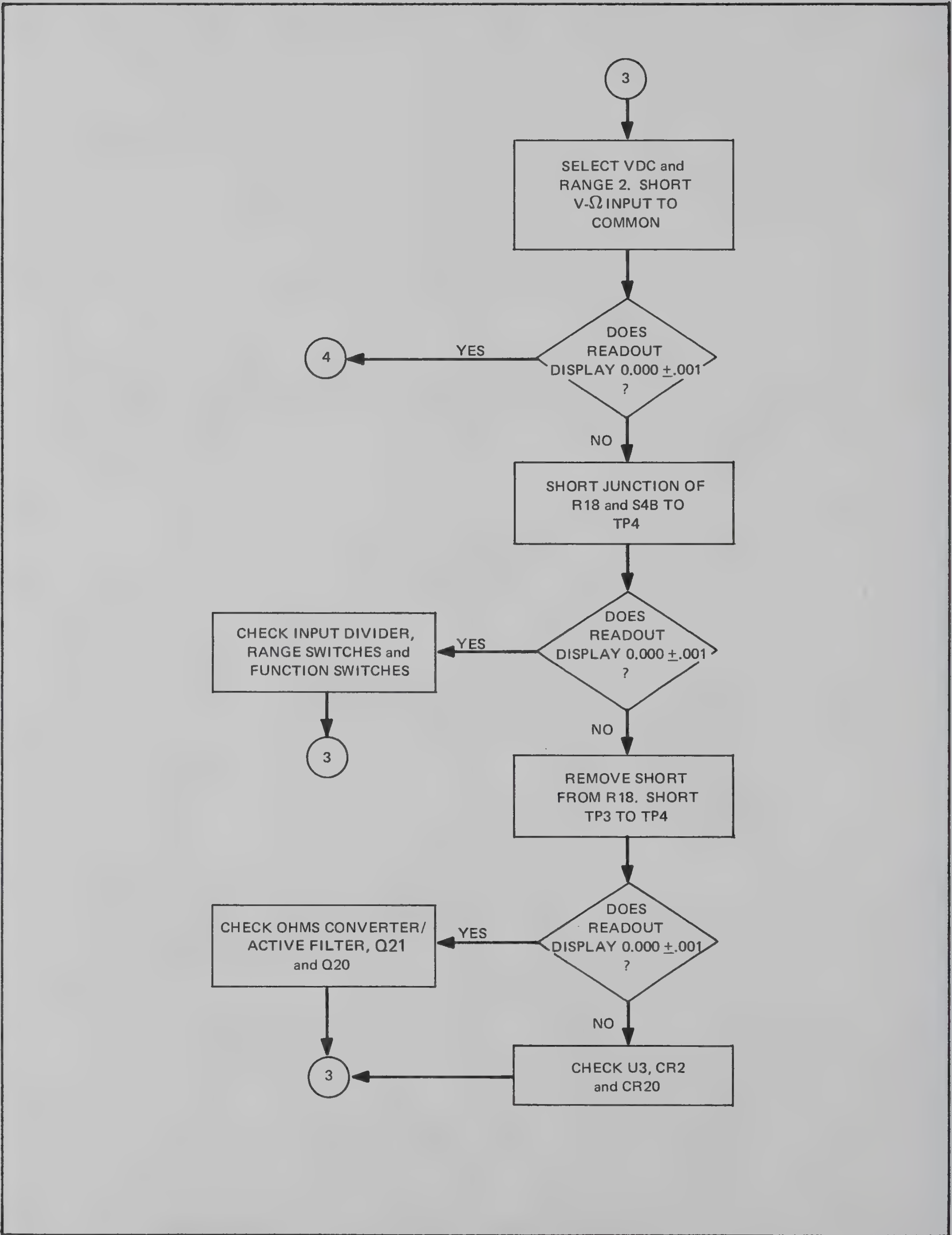


Figure 4-3. 8000A TROUBLESHOOTING FLOW CHART (Sheet 3 of 8)

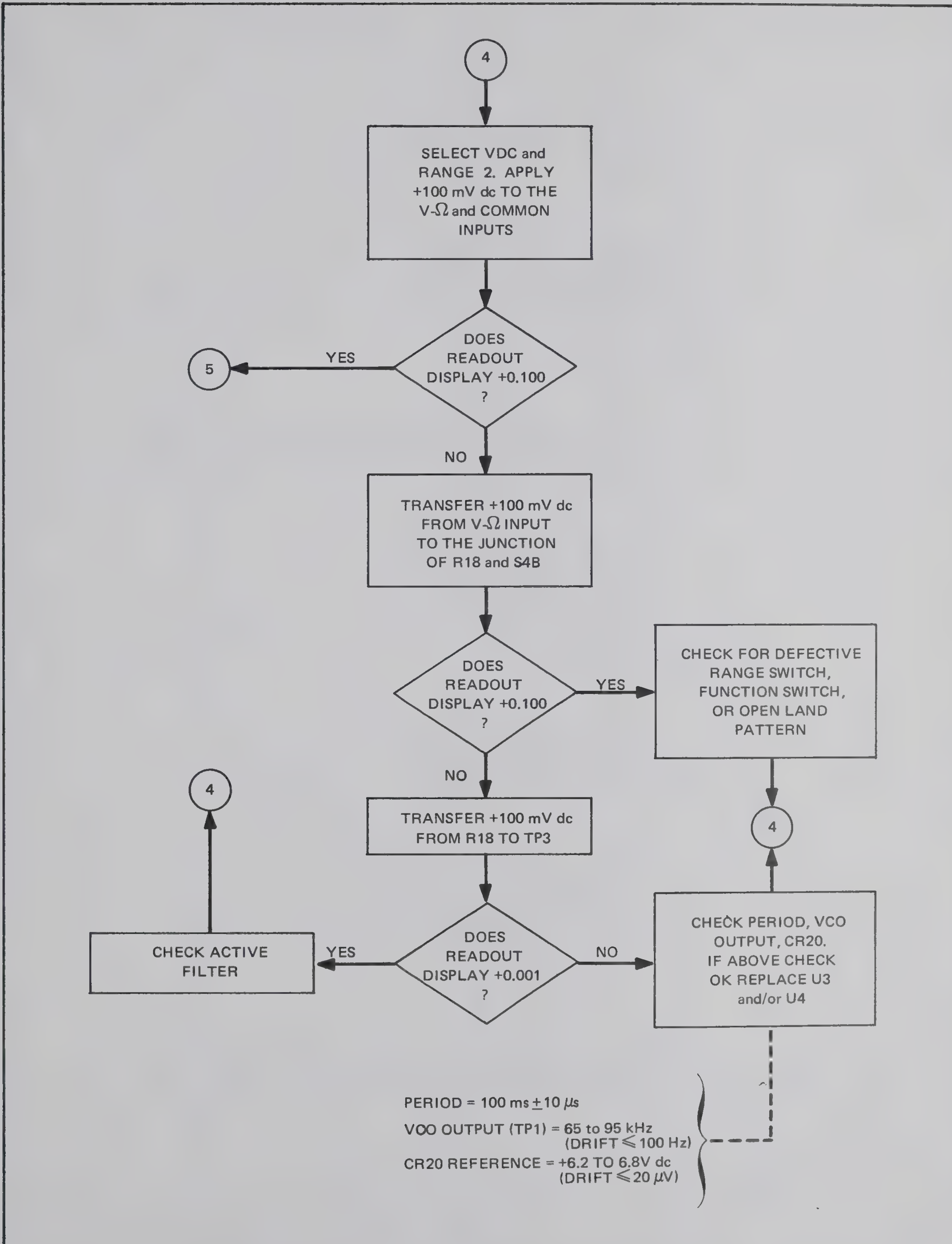


Figure 4-3. 8000A TROUBLESHOOTING FLOW CHART (Sheet 4 of 8)

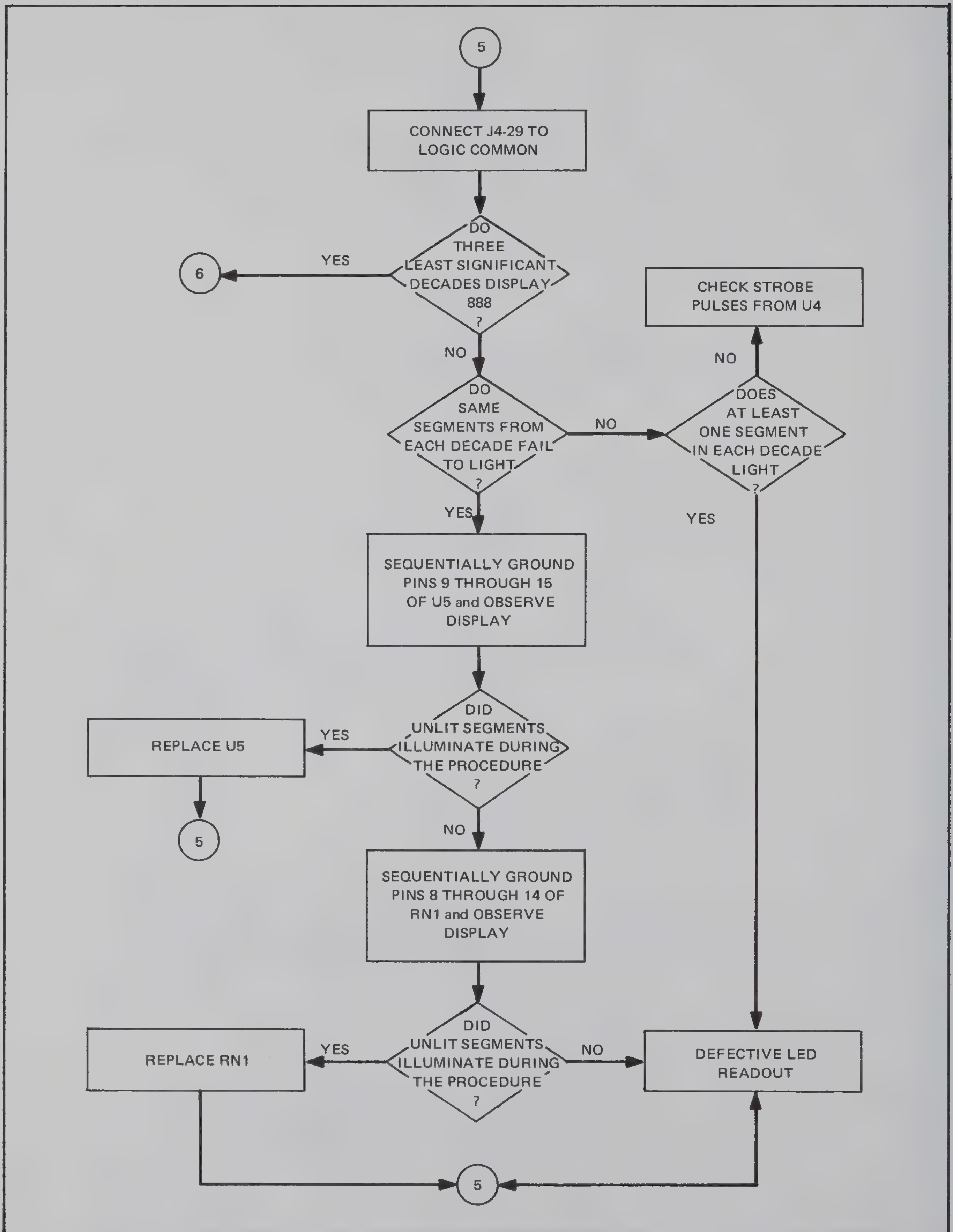


Figure 4-3. 8000A TROUBLESHOOTING FLOW CHART (Sheet 5 of 8)

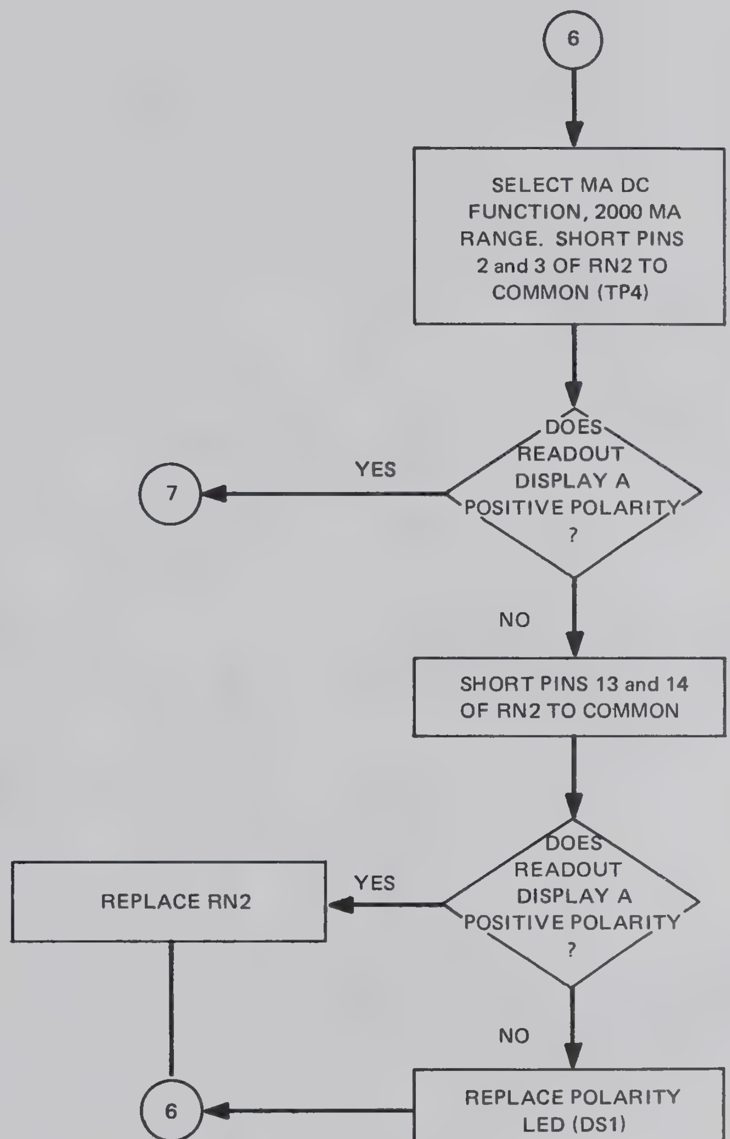


Figure 4-3. 8000A TROUBLESHOOTING FLOW CHART (Sheet 6 of 8)

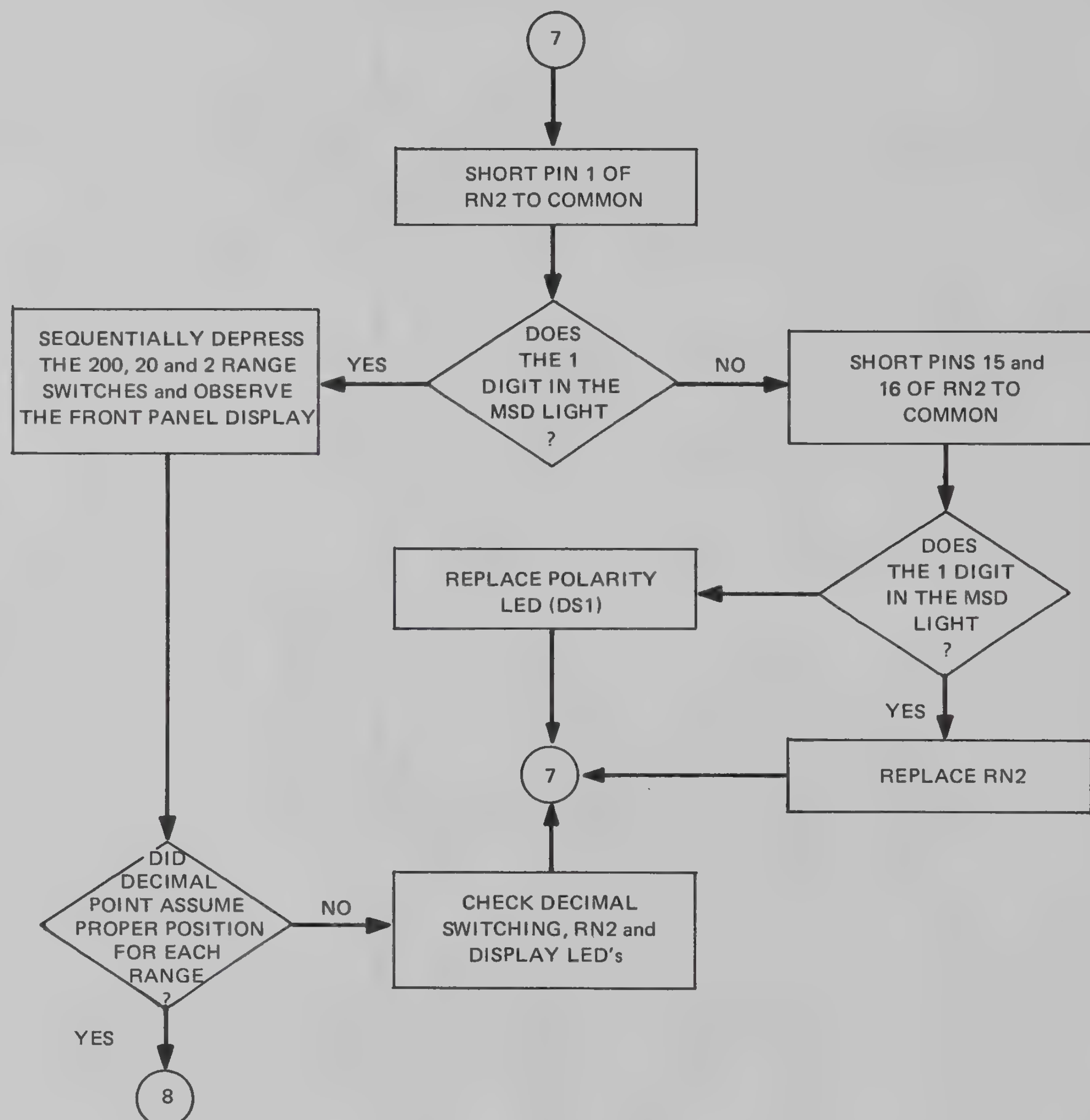


Figure 4-3. 8000A TROUBLESHOOTING FLOW CHART (Sheet 7 of 8)

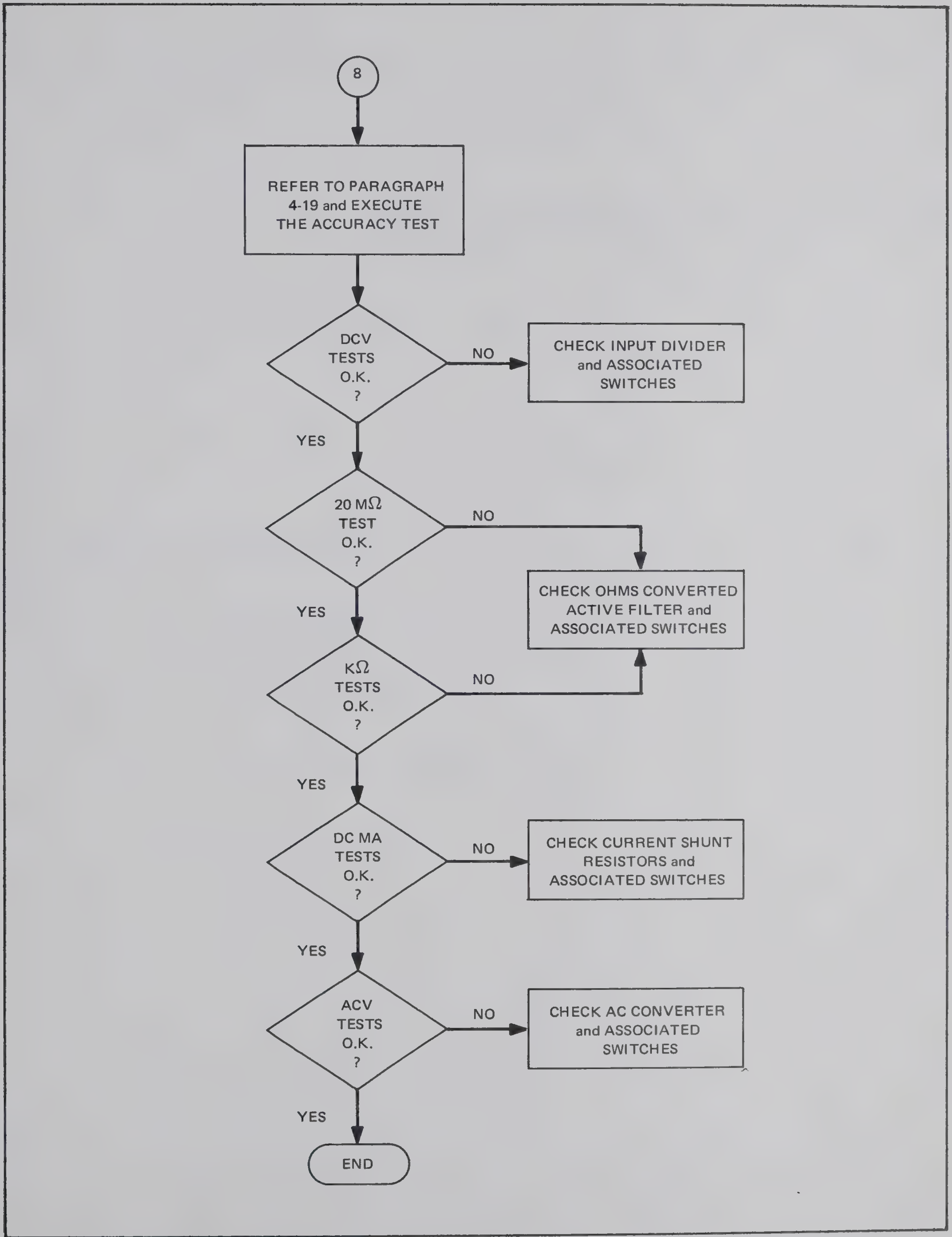


Figure 4-3. 8000A TROUBLESHOOTING FLOW CHART (Sheet 8 of 8)

Section 5

Lists of Replaceable Parts

TABLE OF CONTENTS

5-1. INTRODUCTION

5-2. This section contains an illustrated parts breakdown of the instrument. Components are listed alpha-numerically by assembly. Electrical components are listed by reference designation and mechanical components are listed by item number. Each listed part is shown in an accompanying illustration.

5-3. Parts lists include the following information:

a. Reference Designation or Item Number.

b. Description of each part.

c. Fluke Stock Number.

d. Federal Supply Code for Manufacturers. (See Appendix A for Code-to-Name list.)

e. Manufacturer's part Number or Type.

f. Total Quantity per assembly or component.

g. Recommended Quantity: This entry indicates the recommended number of spare parts necessary to support one to five instruments for a period of two years. This list presumes an availability of common electronic parts at the maintenance site. For maintenance for one year or more at an isolated site, it is recommended that at least one in each assembly in the instrument be stocked. In the case of optional subassemblies, plug-ins, etc. that are not always part of the instrument, or are deviations from the basic instrument mode, the REC QTY column lists the recommended quantity of the item in that particular assembly

h. Use Code is provided to identify certain parts that have been added, deleted or modified during production of the instrument. Each part for which a use code has been assigned may be identified with a particular instrument serial number by consulting the Use Code Effectivity, paragraph 5-7.

5-4. HOW TO OBTAIN PARTS

5-5. Components may be ordered directly from the manufacturer by using the manufacturer's part number, or from the John Fluke Mfg. Co., Inc. factory or authorized representative by using the FLUKE STOCK NUMBER. In the event the part you order has been replaced by a new or improved part, the replacement will be accompanied by an explanatory note and installation instructions, if necessary.

5-6. To ensure prompt and efficient handling of your order, include the following information.

a. Quantity.

b. FLUKE Stock Number.

c. Description.

d. Reference Designation or Item Number.

e. Printed Circuit Board Part Number.

f. Instrument model and Serial number

5-7. USE CODE EFFECTIVITY LIST

USE CODE	SERIAL NUMBER EFFECTIVITY
A	56400 and on
B	62300 and on
C	123 thru 644330, 64390 thru 66244, and 66845 thru 67784
D	64340 thru 64389, 66245 thru 66844, 67785 and on
E	60700 and on
F	68700 and on
G	123 thru 69999
H	70000 and on

FINAL ASSEMBLY, MODEL 8000A

REF DESIG OR ITEM NO.	DESCRIPTION	FLUKE STOCK NO.	MFG FED SPLY CDE	MFG PART NO. OR TYPE	TOT QTY	REC QTY	USE CDE
	FINAL ASSEMBLY, MODEL 8000A						
A1	Main PCB Assembly						
	8000A – Figure 5-1	374223	89536	374223	1		
	8000A-01 – Figure 5-2	374231	89536	374231	1		
	8000A-01/05 – Figure 5-2	378224	89536	378224	1		
	8000A-05	378216	89536	378216	1		
	8000A-06 – Figure 5-3	384818	89536	384818	1		
A2	Front Panel Assembly						
A3	Display Assembly (8000A-05)	387720	89536	387720	1		
	Display Assembly (8000A, 8000A-01)	374355	89536	374355	1		
	Display Assembly (8000A-06)	338376	89536	338376	1		
	Case, molded	330076	89536	330076	1		
	Case, molded (8000A-02)	354274	89536	354274	1		
	Handle, molded	330092	89536	330092	1		
	Line Cord Assembly (115V ac)	343723	89536	343723	1		
	Line Cord Assembly (230V ac)	343780	89536	343780	1		
	Pad, foot	338632	89536	338632	2		
	Test lead set	343657	89536	343657	1		

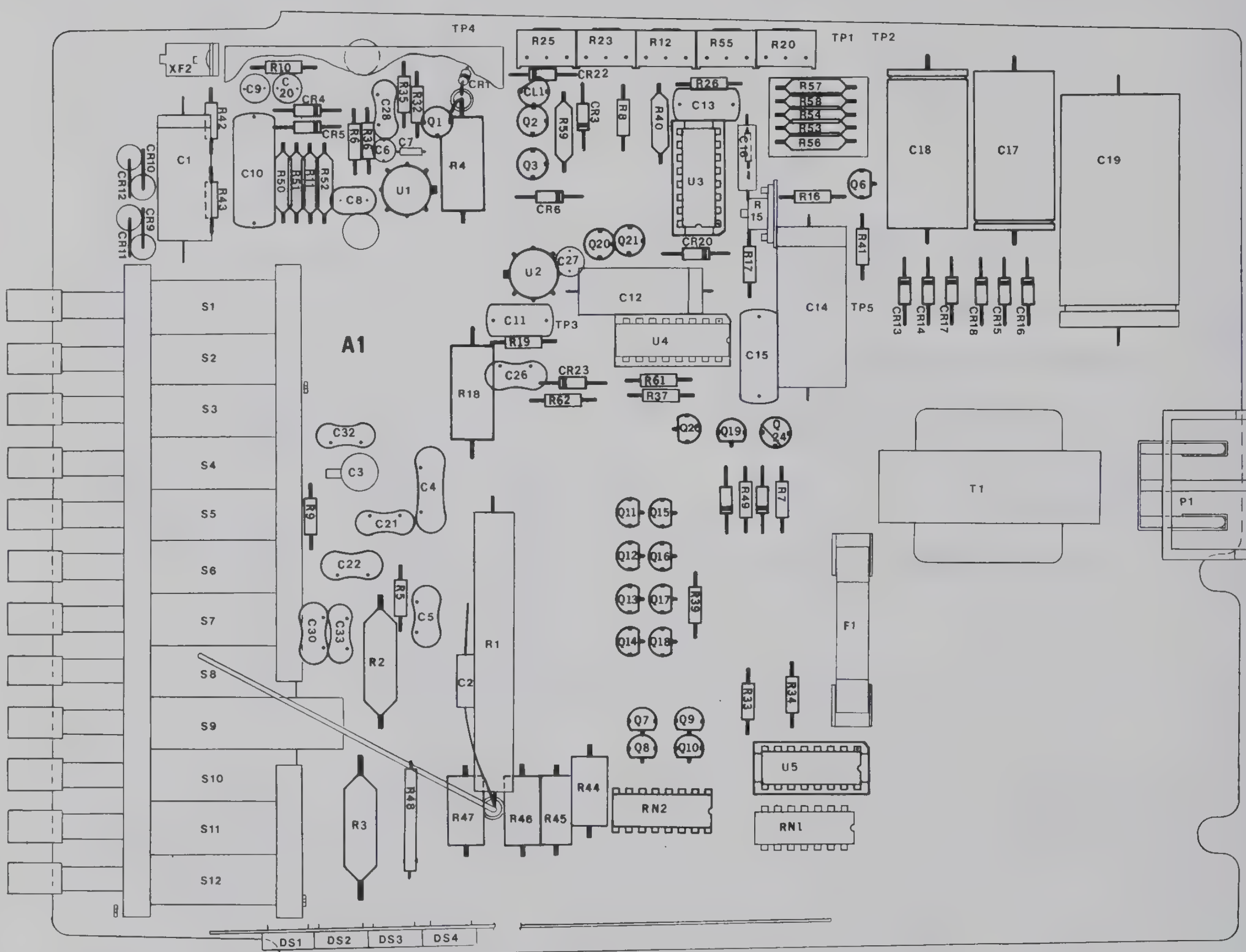


Figure 5-1. 8000A MAIN PCB ASSEMBLY

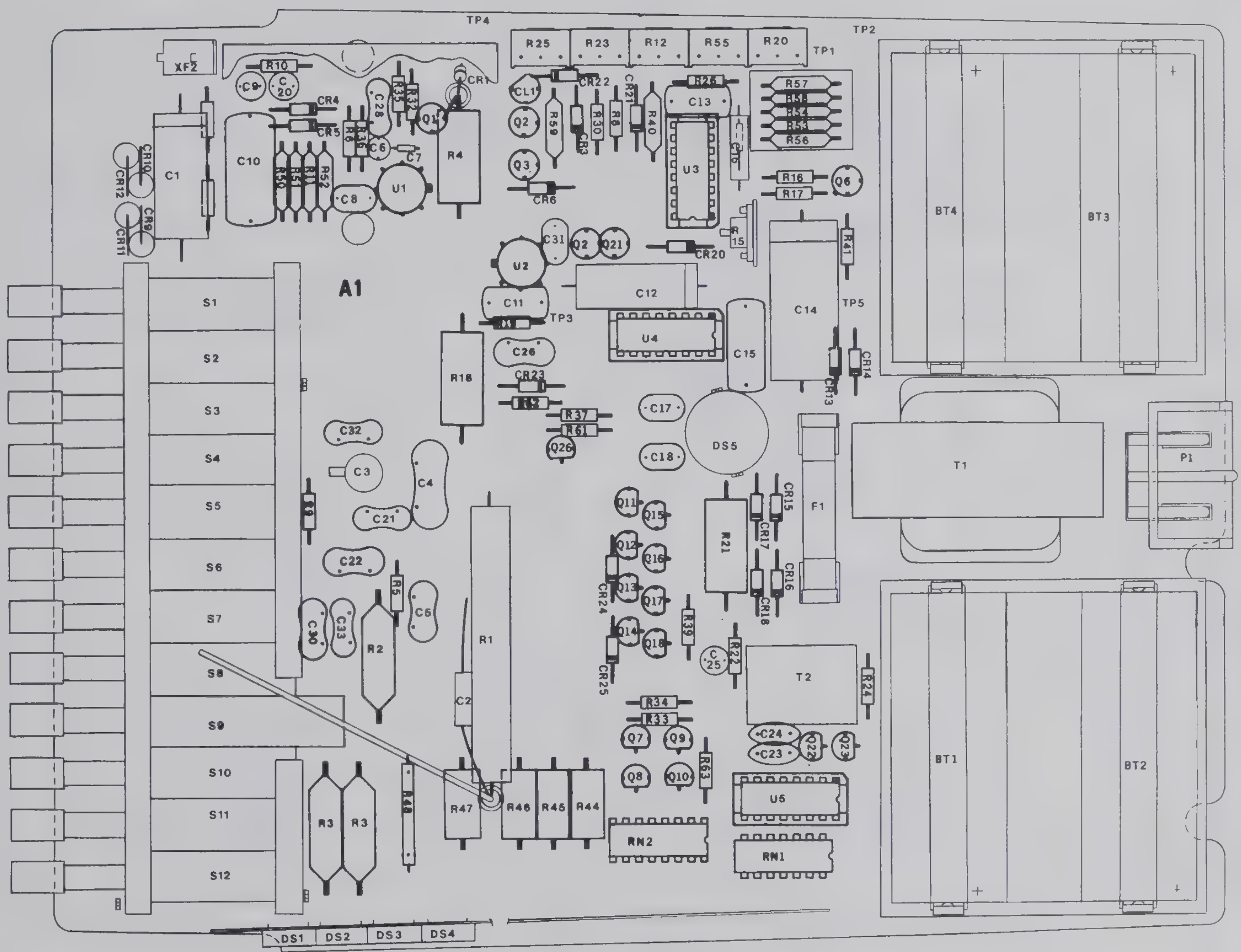


Figure 5-2. 8000A-01 MAIN PCB ASSEMBLY

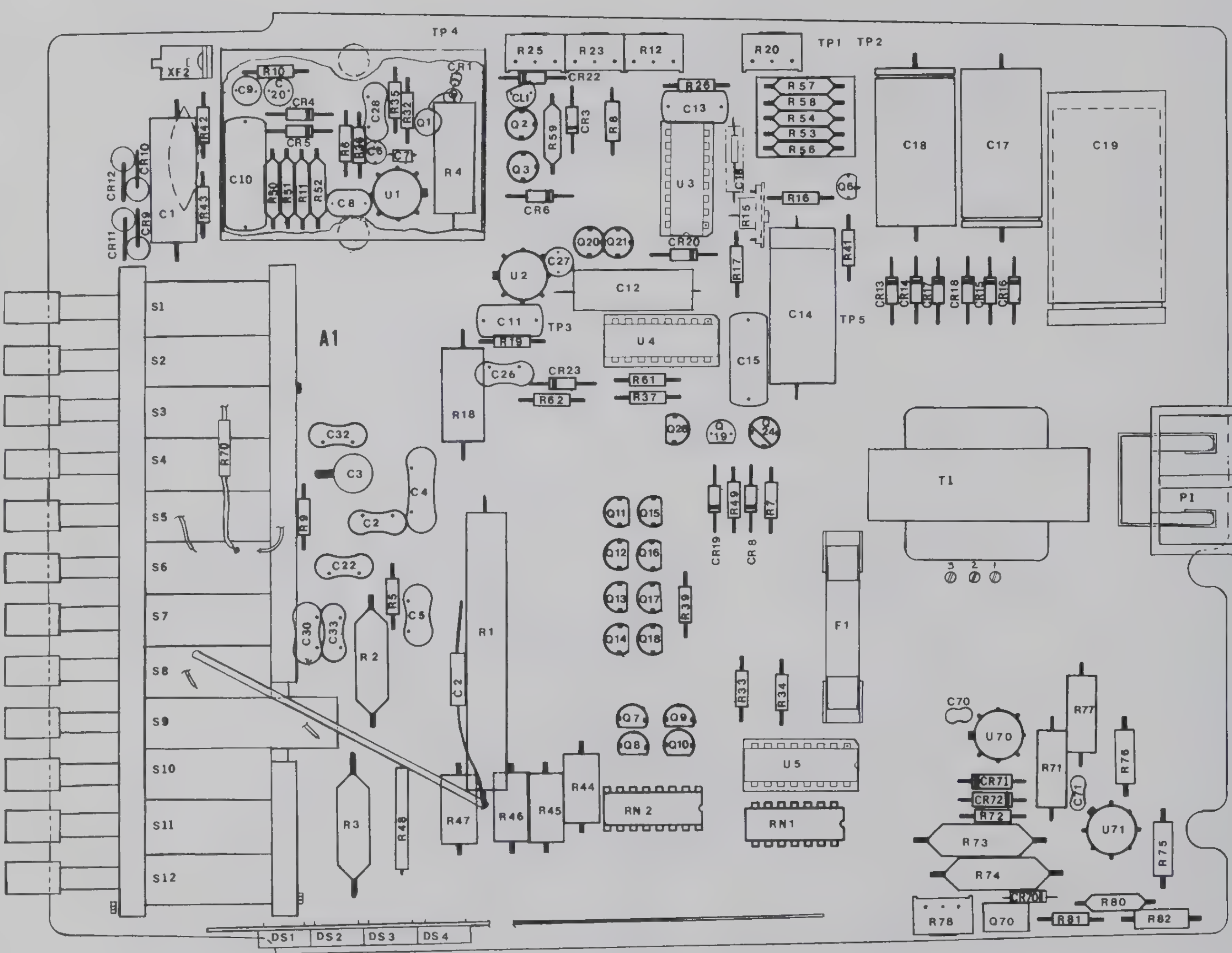


Figure 5-3. 8000A-06 MAIN PCB ASSEMBLY

MAIN PCB ASSEMBLY

REF DESIG OR ITEM NO.	DESCRIPTION	FLUKE STOCK NO.	MFG FED SPLY CDE	MFG PART NO. OR TYPE	TOT QTY	REC QTY	USE CDE
A1	**MAIN PCB ASSEMBLY**				REF		
BT1 thru BT4	Battery, Ni Cd, 1.2V (8000A-01, 8000A-015)	346924	89536	346924	4		
C1	Cap, plstc, 0.33uf ±20%, 1200V	352120	01281	JF83	1		
C2	Cap, porc, 5.1 pf, ±0.25%, 1000V	347948	95275	VY13C5R1CA	1		
C3	Cap, Var, 4.5 - 50 pf, 250V	321117	78899	DVJ305A	1		
C4	Cap, mica, 510 pf ±5%, 500V	148411	71236	DM19ES11J	1		
C5	Cap, mica, 56 pf ±5%, 500V	148528	71236	DM15F5605	1		
C6	Cap, Ta, 0.22uf ±20%, 35V	161331	56289	196D224X0035 HA1	1		
C7	Cap, cer, 32 pf ±2%, 100V	354852	80031	2222-638-10339	1		
C8	Cap, Ta, 68uf ±20%, 15V	193615	56289	196D686X0015 LA3	1		
C9	Cap, Ta, 10uf ±20%, 20V	330662	56289	196D106X0020 JA1	3		
C10	Cap, plstc, 0.47uf ±10%, 250V	184366	73445	C280AE/A470K	1		
C11	Cap, plstc, 0.033uf ±10%, 50V	271841	06001	75F1R5A333	1		
C12	Cap, poly, 0.22uf ±10%, 100V	333823	84171	1PJ223K	1		
C13	Cap, plstc, 0.047uf ±10%, 50V	271858	06001	75F1R5A473	1		
C14	Cap, poly, 0.22uf ±5%, 50V	1			1		
C15	Cap, plstc, 0.22uf ±10%, 250V	194803	25088	B32234A3224K	1		
C16	Cap, cer, or porc, 390 pf ±5%, 500V	1					
C17, C18	Cap, elect, 400uf +50/–10%, 25V (8000A, 8000A-05, 8000A-06)	168153	25403	ET471X025A01	2		
C17, C18	Cap, Ta, 47uf ±20%, 20V (8000A-01)	348516	56289	196D476X0020 LA3	2		
C19	Cap, elect, 4000uf +100/–10%, 10V	330761	25088	B41010-4700/10	1		
C19	Not used on (8000A-01 and 8000A-015)						
C20	Cap, Ta, 10uf ±20%, 20V	330662	56289	196D106X0020 JA1	REF		

MAIN PCB ASSEMBLY

REF DESIG OR ITEM NO.	DESCRIPTION	FLUKE STOCK NO.	MFG FED SPLY CDE	MFG PART NO. OR TYPE	TOT QTY	REC QTY	USE CDE
C21	Cap, mica, 39 pf ±5%, 500V	148544	71236	DM15E390J	2		
C22	Cap, mica, 390 pf ±5%	148437	71236	DM15F391J	1		
C23, C24	Cap, fxd cer, 1000 pf ±10%, 500V (8000A-01)	357806	56289	C106B102G-10 2K	2		
C25, C27	Cap, Ta, 10uf ±20%, 20V (8000A, 8000A-05, 8000A-06)	330662	56289	196D106X0020 JA1	REF		
C27	Cap, mica, 100 pf ±5%, 500V	148494	71236	DM15F101J	1		
C28	Cap, mica, 22 pf ±5%, 500V	148551	71236	DM15C220J	1		
C29	Not used						
C30	Cap, mica, 30 pf ±5%, 500V	340570	71236	DM15E300J	1		
C30	Cap, mica, 240 pf ±5%, 500V (8000A-06)	362863	71236	DM15F241J	1		
C31	Cap, Ta, 47uf ±20%, 20V (8000A-01)	348516	56289	196D476X0020 LA3			
C32	Cap, mica, 39 pf ±5%, 500V	148544	71236	DM15E390F	REF		
C33	Cap, mica, 30 pf ±5%, 500V	340570	71236	DM15E300J	1		
C70	Cap, disc, 300 pf ±10%, 500V	105734	71590	BB60301KW7W	1		
C71	Cap, cer, 33 pf ±2% (8000A-06)	354852	80031	2222-638-10339	1		
CL1	Diode, Current limiter	348482	17856	TYPE E505	1		
CR1, CR4, CR5, CR22, CR23	Diode, Si, small signal	348177	03508	DA2429	5		
CR2	Not used						
CR3	Diode, zener, comp	2			1		
CR6	Diode, zener, uncomp	246033	07910	1N965A	1		
CR7	Not used						
CR8, CR19	Diode, zener, uncomp (not used with 8000A-01)	352377	71590	R4846	2		
CR9, CR10, CR11, CR12	Diode, rectifier, Si	347559	14099	3SM05	4		

MAIN PCB ASSEMBLY

REF DESIG OR ITEM NO.	DESCRIPTION	FLUKE STOCK NO.	MFG FED SPLY CDE	MFG PART NO. OR TYPE	TOT QTY	REC QTY	USE CDE
CR13, CR14	Diode, Si (8000A-01)	343491	77638	1N4200	2		
CR15, CR16, CR17, CR18	Diode, Si (8000A-01)	203323	03508	1N4148	4		
CR13, CR14, CR15, CR16, CR17, CR18	Diode, rectifier, Si	343491	77638	1N4002	6		
CR20	Diode, zener, 6.8V ±5%	1			1		
CR21	Diode, Instl in test if req						
CR24	Diode, rect, Si (8000A-01)	343491	77638	1N4002	2		
CR70	Diode, rect, Si (8000A-06)	368738	77638	1N4004	1		
CR71, CR72	Diode, Si, small signal (8000A-06)	348177	03508	DA2429	2		
DS5	Lamp, Incand, (8000A-01)	352237	08806	63	1		
F1	Fuse, fast act, 1/8 amp (8000A, 8000A-05, 8000A-06)	196790	71400	AGC	1		
F1	Fuse, Slo-Blo, 1/8 amp (8000A-01/05)	166488	71400	MDL	1		
XF1	Fuse, clip	284984	84613	3621-2	2		
XF2	Fuse, contact	338665	89536	338665	1		
P1	Plug power, 3 prong						
	Contact, voltage	338657	89536	338657	2		
	Contact, earth common	338640	89536	338640	1		
	Insulator, line contact	338624	89536	338624	1		
Q1	Xstr, FET, N-Channel	352112	15818	U2610E	1		
Q2, Q3	Xstr, Si, NPN	168716	07263	S19254	2		
Q4	Not used						
Q5	Not used						
Q6	Xstr, Si, PNP	288761	07933	RS2048	1		
Q7, Q8 Q9, Q10 Q15,Q16 Q17,Q18 Q26	Xstr, Si, NPN	218396	04713	2N3904	9		

MAIN PCB ASSEMBLY

REF DESIG OR ITEM NO.	DESCRIPTION	FLUKE STOCK NO.	MFG FED SPLY CDE	MFG PART NO. OR TYPE	TOT QTY	REC QTY	USE CDE
Q11,Q12 Q13,Q14	Xstr, Si, PNP	340026	04713	MPS6563	4		
Q19	Xstr, Si, PNP (8000A, 8000A-06)	352369	04713	2N4403	1		
Q20	Xstr, Si, NPN	352138	89536	352138	1		
Q21	Xstr, Si, PNP	352146	89536	352146	1		
Q22,Q23	Xstr, Si, NPN (8000A-01)	330803	07263	MPS6560	2		
Q24	Xstr, Si, NPN	168708	03508	2N3391	1		
Q25	Not used						
Q70	Xstr	381731	89536	381731	1		
R1	Res, matched set	[3]					
R2	Res, matched set	[3]					
R3	Res, matched set	[3]					
R4	Res, comp, 100k ±10%, 2W	158659	01121	HB1041	1		
R5	Res, comp, 1M ±5%, ¼W	182204	01121	CB1055	1		
R6	Res, comp, 4.7M ±5%, ¼W	220046	01121	CB4755	1		
R7, R49,	Res, car dep, 1k ±5%, ¼W (not used on 8000A-01)	343426	TOYO	R251025	3		
R8	Res, car dep,1k ±5%, ¼W (not used on 8000A-01)	343426	TOYO	R251025	REF		
R9	Res, comp, 10k ±5%, ¼W	148106	01121	CB1035	1		
R10, R42, R43	Res, car dep, 470k ±5%, ¼W	342634	TOYO	R254745	3		
R11	Res, met flm, 10k ±1%, 1/8W	168260	91637	MFF1-81012F	1		
R12	Res, var, cer, 500 ±10%, ½W	291120	71450	360S501A	1		
R13	Not used						
R14	Not used						
R15	Res, var, 50k ±30%, ¼W	358127	71450	X201503	1		
R16	Res, comp, 82k ±5%, ¼W	188458	01121	CB8235	1		
R17	Res, Car dep, 1 ±5%, ¼W	357665	TOYO	R251005	1		
R18	Res, comp, 470k ±10%, 2W	110247	01121	HB4741	1		

MAIN PCB ASSEMBLY

REF DESIG OR ITEM NO.	DESCRIPTION	FLUKE STOCK NO.	MFG FED SPLY CDE	MFG PART NO. OR TYPE	TOT QTY	REC QTY	USE CDE
R19	Res, car dep, 560k ±5%, ¼W	342642	TOYO	R255645	1		
R20	Res, var, 20k ±10%, ½W	291609	71450	360S203A	1		
R21	Res, comp, 22 ±5%, 2W (8000A-01)	352229	01121	HB2205	1		
R22	Res, comp, 330 ± 5%, ¼W (8000A–01)	147967	01121	CB3315	1		
R23	Res, var, 100 ± 10%, ½W	285130	71450	360S101A	1		
R24	Res, comp, 82 ±5%, ¼W (8000–01)	149484	01121	CB8205	1		
R25	Res, var, 1k ±10%, ½W	285155	71450	360S102A	1		
R26	Res, comp, 150k ±5%, ¼W	182212	01121	CB1545	1		
R27, R28, R29, R31	Not used						
R30	Res, 6.8k (8000A-01) (May not be included)						
R32	Res, comp, 2.2k ±5%, ¼W	148049	01121	CB2225	1		
R33, R34, R41	Res, car dep, 3.9k ±5%, ¼W	342600	TOYO	R253R925	3		
R35	Res, comp, 20k ±5%, ¼W	221614	01121	CB2035	1		
R36	Res, comp, 30k ±5%, ¼W	193417	01121	CB3035	1		
R37	Res, carbon, 220k ±5%, ¼W (8000A-06)	348953	TOYO	R252245	1		
R38	Not used						
R39	Res, car dep, 470 ±5%, ¼W	343434	TOYO	R254715	1		
R40	Res, 499k (8000A) (May not be included)						
R44	Res, ww, current shunt, 900	312611	89536	312611	1		
R45	Res, ww, current shunt, 90	352401	89536	352401	1		
R46	Res, ww, current shunt, 9	352419	89536	352419	1		
R47	Res, ww, current shunt, 1	352427	89536	352427	1		
R48	Res, ww, 0.1 ±0.1%, ½W	345579	89536	345579	1		
R50	Res, met flm, 498 ±0.1%, 1/8W	352252	91637	MFF1-84980Por M1PCT	1		

MAIN PCB ASSEMBLY

REF DESIG OR ITEM NO.	DESCRIPTION	FLUKE STOCK NO.	MFG FED SPLY CDE	MFG PART NO. OR TYPE	TOT QTY	REC QTY	USE CDE
R51	Res, met flm, 4.53k ±0.1%, 1/8W	343467	91637	MFF1-84531Por M1PCT	1		
R52	Res, met flm, 10.02k ±0.1%, 1/8W	352245	91637	MFF1-810R021 PorM1PCT	1		
R53	Part of Matched set see	2					
R54	Part of Matched set see	2					
R55	Res, var, cer, 50 ±10%, 1W (not used on 8000A-06)	285122	71450	360S500A	1		
R56	Res, selected in test	1			1		
R57	Res, selected in test	1			1		
R58	Res, selected in test	1			1		
R59	Res, met flm, 6.34k ±1%, 1/8W	2			1		
R60	Not used						
R61	Res, comp, 47k ±5%, ¼W	148163	01121	CB4735	1		
R62	Res, comp, 22M ±5%, ¼W	221986	01121	CB2265	1		
R63	Res, comp, 33 ±5%, ¼W (8000A–01)	175034	01121	CB3305	1		
R70	Res, comp, 100k ±10%, 2W (8000A-06)	158659	01121	HB1041	REF		
R71	Res, comp, 100k ±10%, 1W (8000A-06)	109397	01121	GB1041	1		
R72	Res, comp, 100k ±5%, ¼W (8000A-06)	148189	01121	CB1045	1		
R73	Res, met flm, 10k ±0.1%, ½W (8000A-06)	369363	91637	NFF1-2103	1		
R74	Res, met flm, 100k ±0.1%, ½W (8000A-06)	369371	91637	NFF1-2104	1		
R75	Res, comp, 18M ±10%, ½W (8000A-06)	108985	01121	EB1861	1		
R76	Res, comp, 15M ±10%, ½W (8000A-06)	108647	01121	EB1561	1		
R77	Res, met flm, 1.02k ±1%, 1/8W (8000A-06)	347138	91637	MFF1-81R022P orM1PCT	1		
R78	Res, var, 200 ±10%, ½W (8000A-06)	285148	80294	3389R-M09-201	1		
R80	Res, met flm, 634 ±1%, 1/8W (8000A-06)	289306	91637	MFF1-86340Por M1PCT	1		
R81	Res, comp, 390 ±5%, ¼W (8000A-06)	147975	01121	CB3915	1		
R82	Res, comp, 330 ±5%, ½W (8000A-06)	108936	01121	CB3315	1		

MAIN PCB ASSEMBLY

REF DESIG OR ITEM NO.	DESCRIPTION	FLUKE STOCK NO.	MFG FED SPLY CDE	MFG PART NO. OR TYPE	TOT QTY	REC QTY	USE CDE
RN1	Res, network, 8 pc (8000A)	381616	89536	381616	1		
RN1	Res, network, 8 pc (8000A-01, 8000A-05, 8000A-06)	344069	89536	344069	1		
RN2	Res, network, 11 pc (8000A)	344077	89536	344077	1		
RN2	Res, network, 11 pc (8000A-01, 8000A-05, 8000A-06)	381608	89536	381608	1		
S1 thru S11	Switch Assembly	342915	89536	342915	1		
S12	Pushbutton, grn	352211	71590	J52305J71449	1		
T1	Xfmr, 115/230 (8000A, 8000A-02, 8000A-05, 8000A-06)	345629	89536	345629	1		
	Xfmr, 115/230 (8000A-01)	345637	89536	345637	1		
	Xfmr, 100V (8000A, 8000A-02)	345645	89536	345645	1		
	Xfmr, 100V (8000A-01)	345652	89536	345652	1		
T2	Xfmr, inverter (8000A-01)	354191	89536	354191	1		
U1	IC, Op, Amp	352930	49956	LM301AH	1		
U2	IC, Op, Amp, J-FET input	2			1		
U3	IC, Analog	1		Changed to 418814			
U4	IC, Digital	~~375154~~	89536	~~375154~~	1		
U5	IC, TTL Decoder/Driver	340109	01295	SN7447AN	1		
U70	IC, linear, op. amp (8000A-06)	288928	12040	LM308AH	1		
U71	IC, linear, op. amp (8000A-06)	271502	07933	LM301AH	1		
	Contact, battery (8000A-01)	344200	89536	344200	8		
	Holder, battery (8000A-01)	346932	89536	346932	2		
	Post, conn, uninsulated	267500	00779	86144-2	3		
	Shield, AC Conv	338673	89536	338673	1		
	Socket, IC, 16 pin (U3, U4, U5)	351916	82305	14-40P	3		
	Socket, short, 10 contact	347815	82305	14-77	1		

MAIN PCB ASSEMBLY

REF DESIG OR ITEM NO.	DESCRIPTION	FLUKE STOCK NO.	MFG FED SPLY CDE	MFG PART NO. OR TYPE	TOT QTY	REC QTY	USE CDE
	1 C14, C16, CR20, R56, R57, R58 and U3 are a matched set. For replacement, order ANALOG RESISTOR SET, stock number 345496.						
	2 CR3, R53, R54, R59 and U2 are a matched set. For replacement, order OHMS RESISTOR SET, stock number 345504.						
	3 R1, R2 and R3 are a matched set. For replacement, order INPUT DIVIDER RESISTOR SET, stock number 306407.						

FRONT PANEL ASSEMBLY

REF DESIG OR ITEM NO.	DESCRIPTION	FLUKE STOCK NO.	MFG FED SPLY CDE	MFG PART NO. OR TYPE	TOT QTY	REC QTY	USE CDE
A2	**FRONT PANEL ASSEMBLY**						
F2	Fuse, fast acting, 2 amp	346940	89536	346940	1		
J1	Jack, banana, red	162065	74970	108902	3		
J2/ XF2	Jack/Fuseholder, banana, red	345611	89536	345611	1		
J3	Jack, banana, blk	162073	74970	108903	2		
J5	Jack, banana, red (8000A-05)	162065	74970	108902	REF		
J6	Jack, banana, red (8000A-06)	162065	74970	108902	REF		
J6	Jack, banana, blk (8000A-05)	162073	74970	108903	REF		
R1/ S1	Res, var/Switch, DPDT (8000A-06)	381483	01121	12M937	1		
R1	Res, shunt, 0.01 ±0.2% (8000A-05)	374389	89536	374389	1		
	PCB, low ohms (8000A-06)	384917	89536	384917	1		
	Harness (8000A-06)	384925	89536	384925	1		
	Lens, red (8000A, 8000A-01)	338616	89536	338616	1		
	Lens, red (8000A-05)	374355	89536	374355	1		
	Lens, red (8000A-06)	384909	89536	384909	1		
	Retainer, neoprene	352484	28708	9109E	2		
	Clamp, cable	172080	06383	SST-1	1		
	Panel, front, molded (8000A, 8000A-01)	330084	89536	330084	1		
	Panel, front, molded (8000A-05, 8000A-06)	374363	89536	374363	1		
	Retainer, neoprene (8000A-06)	352484	28708	9109E	2		
	Decal, front panel	343756	89536	343756	1		
	Decal, front panel (8000A-06)	385369	89536	385369	1		
	Decal, 10A Range (8000A-05)	374371	89536	374371	1		
	Decal, disc (8000A-06)	236950	89536	236950	1		
	Knob, vernier (8000A-06)	241018	89536	241018	1		

DISPLAY ASSEMBLY

REF DESIG OR ITEM NO.	DESCRIPTION	FLUKE STOCK NO.	MFG FED SPLY CDE	MFG PART NO. OR TYPE	TOT QTY	REC QTY	USE CDE
A3	DISPLAY ASSEMBLY	387738	89536	387738	REF		
DS1	Diode, light-emitting (± and 1)	380444	50579	DL707-812	1		
DS2	Diode, light-emitting, alphameric	380436	50579	DL707-811	3		
DS3	Diode, light-emitting, alphameric	380436	50579	DL707-811	REF		
DS4	Diode, light-emitting, alphameric	380436	50579	DL707-811	REF		

DIGITAL PRINTER OUTPUT UNIT, OPTION –02

REF DESIG OR ITEM NO.	DESCRIPTION	FLUKE STOCK NO.	MFG FED SPLY CDE	MFG PART NO. OR TYPE	TOT QTY	REC QTY	USE CDE
	DIGITAL PRINTER OUTPUT UNIT, OPTION –02 (Figure 5-4)						
C1	Cap, cer, 500 pf ±10%, 500V	105692	71590	Type CE501	2		
C2	Cap, cer, 500pf ±10%, 500V	105692	71590	Type CE501	REF		
CR1	Diode, sil, 150mA	203323	07263	1N4148	4		
CR2	Diode, sil, 150mA	203323	07263	1N4148	REF		
CR3	Diode, sil, 150mA	203323	07263	1N4148	REF		
CR4	Diode, sil, 150mA	203323	07263	1N4148	REF		
P1	Connector, card edge, 20 contact	352310	NAT. CONN.	A202389-04	1		
R1	Res, comp, 10k ±5%, ¼W	148106	01121	CB1035	3		
R2	Res, comp, 100k ±5%, ¼W	148189	01121	CB1045	2		
R3	Not used						
R4	Res, comp, 33k ±5%, ¼W	148155	01121	CB3335	1		
R5	Res, comp, 10k ±5%, ¼W	148106	01121	CB1035	REF		
R6	Res, comp, 100k ±5%, ¼W	148189	01121	CB1045	REF		
R7	Res, comp, 10k ±5%, ¼W	148106	01121	CB1035	REF		
RN1	Res, network, 7 res, 15k ±5%, ¼W	352054	56289	#760-3	4		
RN2	Res, network, 7 res, 15k ±5%, ¼W	352054	56289	#760-3	REF		
RN3	Res, network, 7 res, 15k ±5%, ¼W	352054	56289	#760-3	REF		
RN4	Res, network, 13 res, 15k ±5%, ¼W	352047	56289	#760-1	1		
RN5	Res, network, 7 res, 15k ±5%, ¼W	352054	56289	#760-3	REF		E
U1	I.C.,MOS, dual D flip-flop	340117	04713	MC14013L	1		
U2	I.C., MOS, dual 4-bit shift register	340125	04713	MC14015CL	2		
U3	E.C., MOS, dual 4-bit shift register	340125	04713	MC14015CL	REF		
U4	I.C., hex inverter	352039	12040	SN7404N	1		
U5, U6, U7	Not used						

DIGITAL PRINTER OUTPUT UNIT, OPTION –02

REF DESIG OR ITEM NO.	DESCRIPTION	FLUKE STOCK NO.	MFG FED SPLY CDE	MFG PART NO. OR TYPE	TOT QTY	REC QTY	USE CDE
U8	I.C., linear, 5 tstr., NPN sil	248906	95303	CA3046	4		
U9	I.C., linear, 5 tstr., NPN sil	248906	95303	CA3046	REF		
U10	I.C., linear, 5 tstr, NPN sil	248906	95303	CA3046	REF		
U11	I.C., linear, 5 tstr., NPN sil	248906	95303	CA3046	REF		
	Backshell, connector	357020	89536	357020	1		

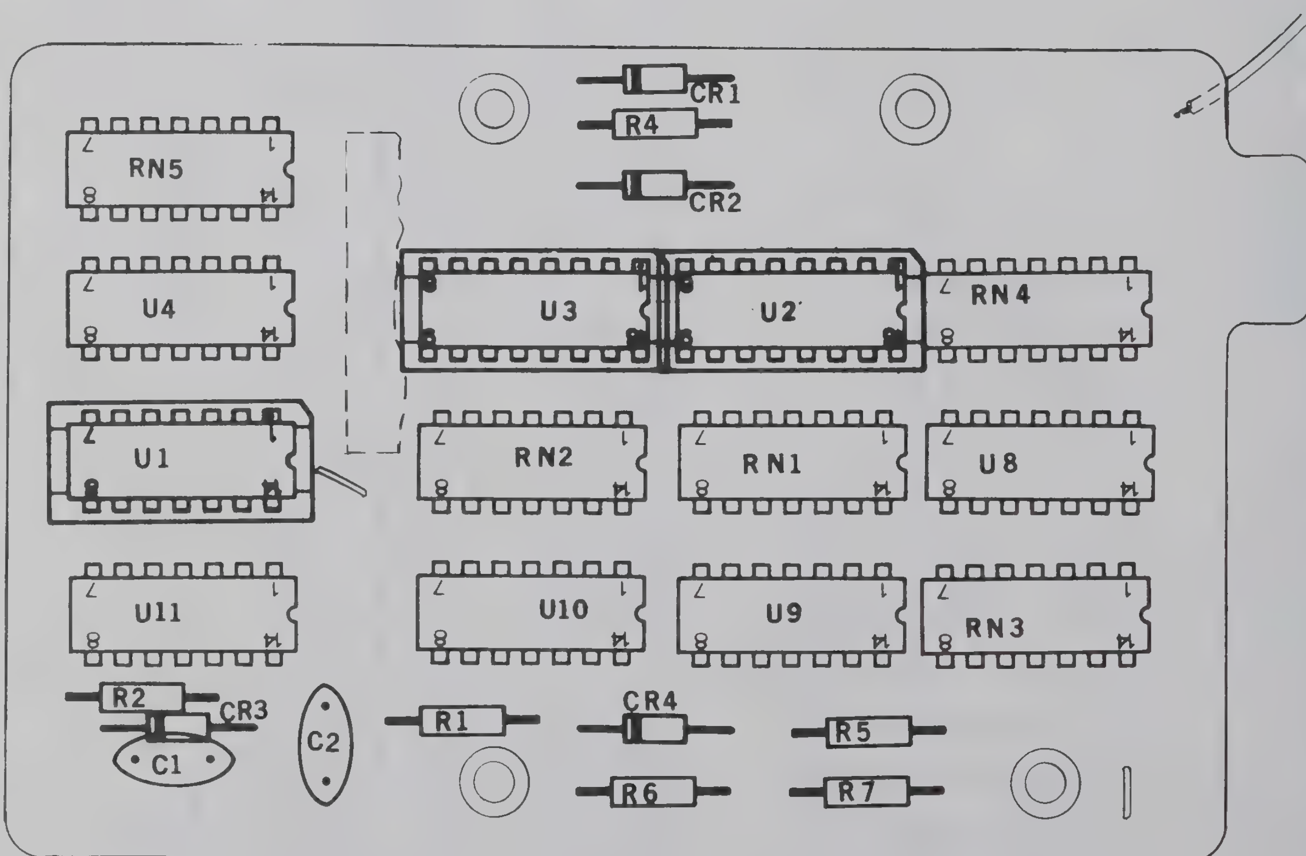


Figure 5-4. DPOU PCB ASSEMBLY, OPTION –02

Section 6

Option & Accessory Information

6-1. INTRODUCTION

6-2. This section of the manual contains information pertaining to the options and accessories available for your instrument. Each of the options and accessories are described under separate major headings containing the model or option number. The option descriptions contain applicable operating and maintenance instruction, and field installation procedures. Replaceable parts and schematics for all options are given in Sections 5 and 7, respectively.

6-3. CARRYING CASE (C80)

6-4. The Model C80 Carrying Case, Figure 6-1, is a soft vinyl plastic container, designed for the storage and transport of the 8000A. The case provides the 8000A with adequate protection against normal handling and storage conditions. A separate storage compartment is provided for test leads, power cord, and other compact accessories.

6-5. CARRYING CASE (C86)

6-6. The Model C86 Carrying Case, Figure 6-2, is a molded polyethylene container, with handle, designed for use in transporting the 8000A. This rugged case provides the 8000A with maximum protection against rough handling and adverse weather conditions. A separate storage compartment is provided for test leads, power cord, and other compact accessories.

6-7. FRONT PANEL DUST COVER (M00-100-714)

6-8. The front panel dust cover is a molded plastic snap-on accessory which fits over the front panel of the 8000A. The dust cover provides protection for the front panel controls, and is useful when storing or transporting the 8000A.

6-9. RACK MOUNTING KITS

6-10. Introduction

6-11. Three rack mounting kits are available for mounting the 8000A in a standard 19-inch equipment rack. The kits, listed in Table 6-1, provide the option of either offset mounting (left/right), center mounting or side-by-side mounting.

Figure 6-1. MODEL C80 CARRYING CASE

Figure 6-2. MODEL C86 CARRYING CASE

6-12. Installation Procedure

6-13. Installation instructions for each of the rack mounting kits is given in the following paragraphs. Use the procedure which corresponds to the model number of the kit being installed.

6-14. OFFSET AND CENTER MOUNTING KITS (M00-200-611 and M00-200-612)

a. Remove 8000A carrying handle by removing the handle disc decals and the handle mounting screws.

b. Remove screw from rear of case and separate the case from the 8000A.

c. Install the side mounting brackets, as shown in Figure 6-3, and secure them to the mounting panel using the nuts provided.

d. Insert the front of the 8000A case through the opening on the back side of the mounting panel.

e. Install the handle mounting screws through the side brackets into the handle mounting bosses. Don't over tighten these screws.

f. Slide the 8000A through the mounting panel and into the case. Install and tighten the retaining screw at the rear of the case.

6-15. SIDE–BY–SIDE MOUNTING KIT (M00-200-613)

a. Remove the carrying handles from both 8000A's by removing the handle disc decals and the handle mounting screws.

b. Remove the retaining screw from the rear of the cases and separate the instruments from their cases.

c. Install the center mounting bracket, as shown in Figure 6-4, and secure it to the mounting panel using the nuts provided.

d. Install the clamp screw in the center mounting bracket using the nuts and washers provided.

e. Insert the front of the 8000A cases through the openings on the back side of the mounting panel. Make sure the case's handle mounting bosses are inserted into the clamp hole of the center mounting bracket

f. Tighten the clamp screw.

g. Install the side mounting brackets and secure them to the front panel using the nuts provided.

h. Install the handle mounting screws through the side brackets into the handle mounting bosses. Don't over tighten these screws.

i. Slide the 8000A's through the mounting panel and into their cases. Install and tighten the retaining screw at the rear of both cases.

Table 6-1. RACK MOUNTING KITS

MOUNTING STYLE	MODEL NUMBER
Offset	M00-200-611
Center	M00-200-612
Side-By-Side	M00-200-613

6-16. DELUXE TEST LEAD KIT (A80)

6-17. The deluxe test lead kit, shown in Figure 6-5, contains two test leads with probes (red and black), and five pairs of universal probe tips. The probe tips include: alligator clips, test prod tips, pin tips, banana plug tips, and binding post lugs. A convenient plastic pouch is provided for storing the contents of the test lead kit.

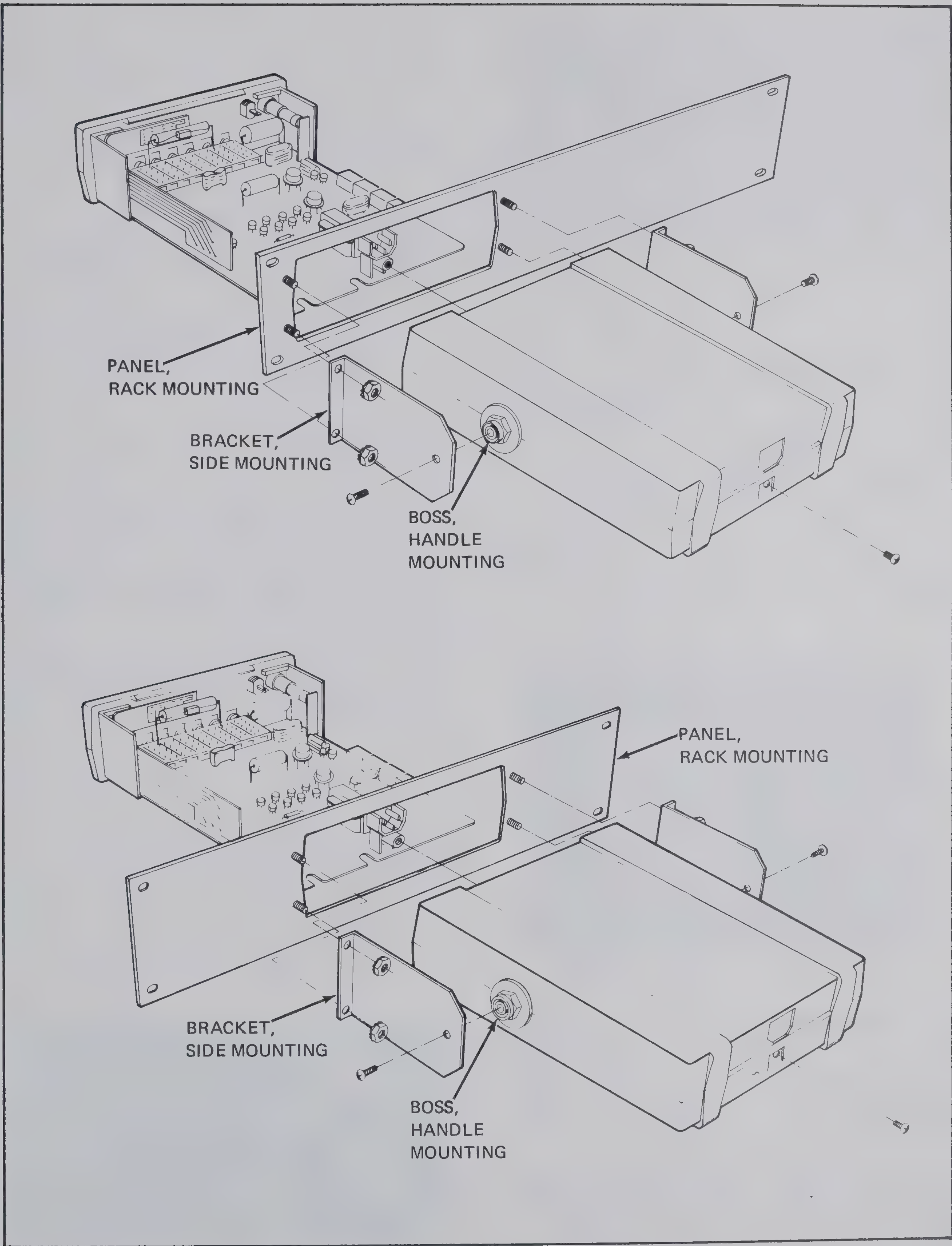


Figure 6-3. RACK MOUNTING KITS, OFFSET AND CENTER MOUNTING

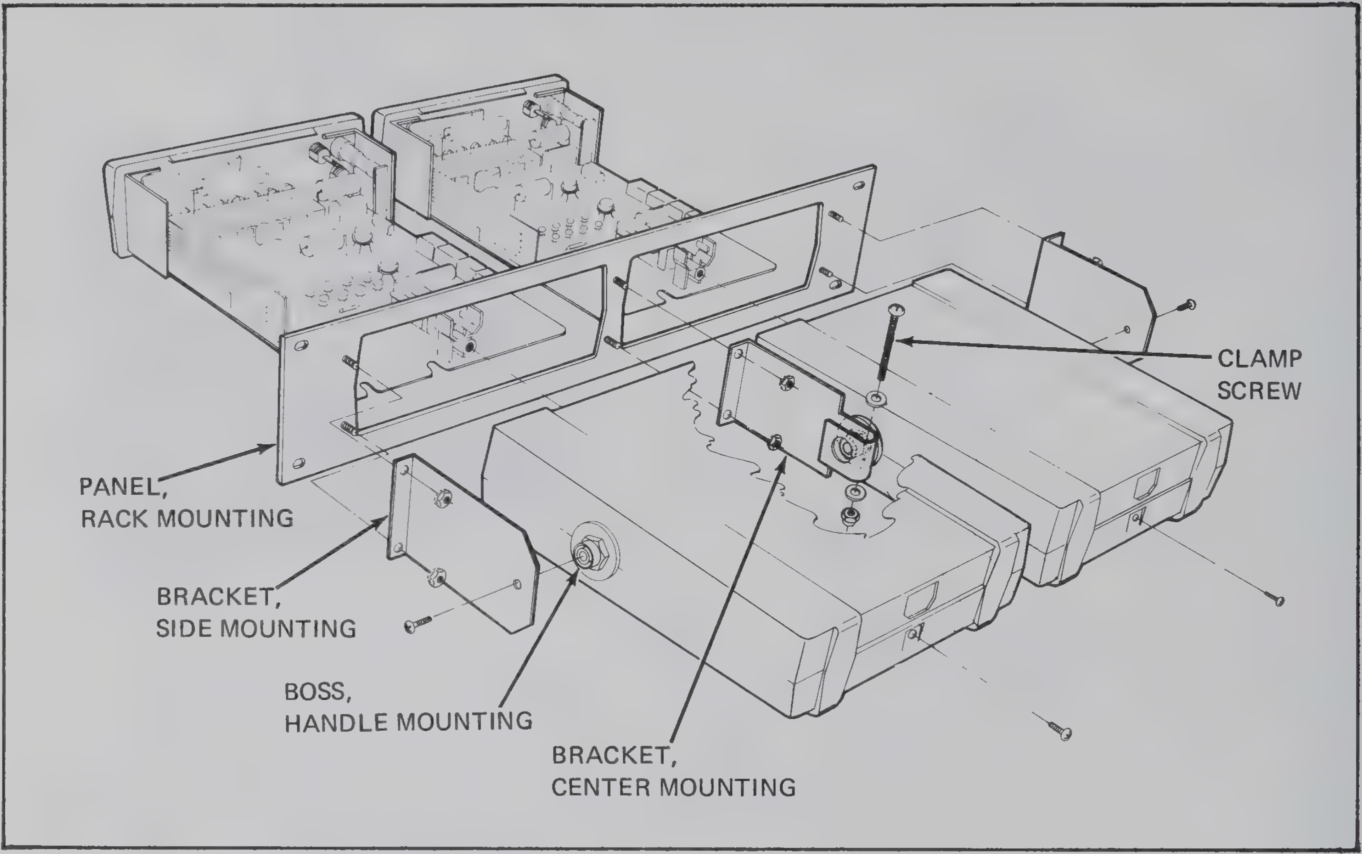


Figure 6-4. RACK MOUNTING KIT, SIDE-BY-SIDE MOUNTING

Figure 6-5. DELUXE TEST LEAD KIT (A80)

6-18. CURRENT PROBE, CLAMP-ON (80I-600)

6-19. Introduction

6-20. The Model 80I-600, as shown in Figure 6-6, is a clamp-on current probe which is used to extend the current measurement capabilities of the 8000A. The probe is designed to measure currents of 2 to 600 amperes at frequencies of up to 400 Hz with ±3% accuracy. The clamp-on feature allows current to be measured without breaking the circuit under test.

6-21. Operation

6-22. Use the following procedure for operating the 8000A with the 80I-600 probe:

a. Plug the 80I-600 dual-banana plug into the MA and COMMON INPUT terminals on the 8000A.

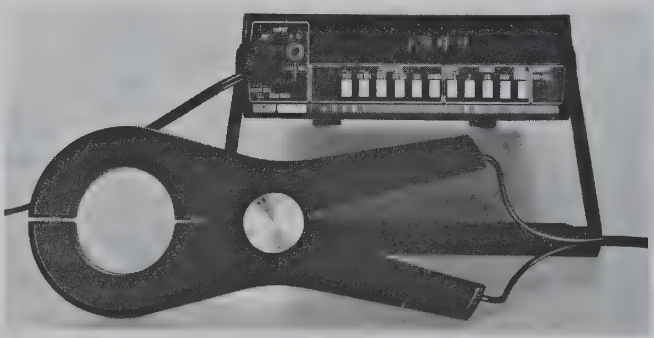


Figure 6-6. AC CURRENT PROBE, CLAMP-ON (80I-600)

b. Depress the AC MA pushbutton (FUNCTION)

c. Select the desired current range in accordance with Table 6-2.

d. Clamp probe around current carrying conductor to be measure.

e. Observe ac current reading in amperes on the 8000A readout.

NOTE

Clamping the probe around more than one current carrying conductor at a time produces a reading that is the vector sum of the currents in the conductors.

Table 6-2. 8000A RANGES FOR CURRENT PROBE (801-600)

8000A RANGE SELECTED	8000A CURRENT RANGE WITH 801-600 PROBE
2000 MA	200A to 600A
200	20A to 200A
20	2A to 20A

6-23. HIGH VOLTAGE PROBE (80K40)

6-24. Introduction

6-25. The Model 80K-40 High Voltage Probe as shown in Figure 6-7, provides the 1000X attenuation necessary to extend the dc voltage measuring capabilities of the 8000A up to 40 kV dc. A schematic of the 80K-40 probe is shown in Figure 6-8.

6-26. Specifications

Overall Accuracy:	20kV to 30kV ±2% (Calibrated 1% at 25kV)
Upper Limit:	Changes linear from 2% at 30kV to 4% at 40kV
Lower Limit:	Changes linear from 2% at 20kV to 4% at 1kV
Voltage Range:	1kV to 40kV
Input Resistance:	1000MΩ
Division Ratio:	1000:1

Figure 6-7. HIGH VOLTAGE PROBE (80K-40)

6-27. Operation

6-28. Use the following procedure for operating the 8000A with the 80K-40 probe:

a. Plug the 80K-40 dual-banana plug into the V-Ω and COMMON INPUT terminals on the 8000A.

b. Depress the DCV pushbutton (FUNCTION)

c. Select the desired voltage range in accordance with Table 6-3.

d. Connect the common probe lead to a suitable ground and touch the probe tip to the circuit point to be measured.

e. Observe dc voltage reading displayed in kilovolts on the 8000A readout.

CAUTION

Before touching probe tip to a high voltage source, always connected probe common lead to circuit common. Removal of the probe common connection during a measurement may result in damage to the 8000A.

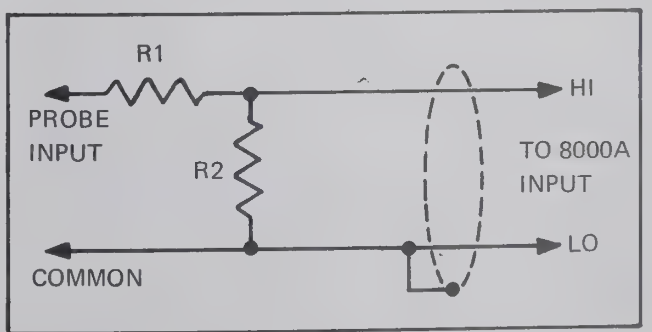


Figure 6-8. HIGH VOLTAGE PROBE, SCHEMATIC

Table 6-3. 8000A RANGES FOR DC HV PROBE (80K-40)

8000A RANGE SELECTED	8000A VOLTAGE RANGE WITH 80K-40 PROBE
200	20 to 40 kV
20	2 to 20 kV
2	1 to 2 kV

6-29. HIGH FREQUENCY PROBE (80RF-1)

6-30. Introduction

6-31. The Model 80RF-1 High Frequency Probe, Figure 6-9, extends the frequency range of the 8000A to include 100 kHz to 500 MHz for ac voltage measurements from 0.25 to 30V rms. The 80RF-1 operates in conjunction with the dc voltage ranges, and is connected to the 8000A using a shielded dual-banana plug and an adapter.

6-32. Specifications

Voltage:	0.25V to 30V
Response:	Responds to peak value of input. Calibrated to read rms value of a sine wave input.
AC to DC Transfer Accuracy:	Loaded with 10 megohms ±10%.

	100 kHz–100 MHz	100 MHz–500 MHz
+10°C to +30°C	+5%	+7%
–10°C to +40°C	+7%	+15%

< ±3 db at 10 kHz and 700 MHz

Input Impedance:	4 megohms shunted by 2 ±0.5 pf
Maximum Input:	30 volts rms ac, 200 volts dc
Cable Connections:	Shielded dual banana plug fits all standard ¾-inch dual banana connectors.
Cable Length:	4 ft.(121,9 cm) minimum
Weight:	3½ oz. net
Accessories:	Ground lead, straight tip, hook tip, high frequency adapter

6-33. Operating Notes

6-34. The straight and the hooked tips supplied with the probe are useful for making voltage measurements up to 100 MHz. For measurements above 100 MHz use the high frequency adapter tip with mating connector and 50 ohm terminations.

6-35. The maximum input to the probe is 30V rms or 200V dc. These voltage limits may be used in combination so that the ac component of an ac signal superimposed on dc level can be measured.

CAUTION

Changing the dc level of the input signal by more than 200 volts will damage the probe.

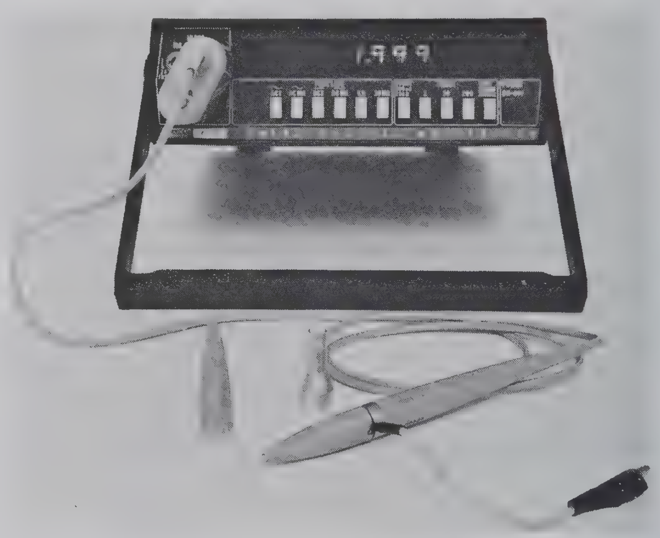


Figure 6-9. 80RF–1, HIGH FREQUENCY PROBE

6-36. Operation

6-37. Use the following procedure for operating the 8000A with the 80RF-1 probe:

a. Connect the 80RF-1 shielded dual-banana plug to the 8000A V-Ω and COMMON INPUT terminals.

b. Attach the desired probe tip to the probe body.

c. Depress the DCV pushbutton (FUNCTION)

d. Select the desired voltage range.

e. Connect the probe's ground lead to a suitable ground when using the straight or hooked probe tip. The ground clip is not required when using the high frequency adapter with an appropriate 50 ohm termination.

f. Touch the probe tip to the circuit point to be measured.

g. Observe the voltage reading displayed in volts rms on the 8000A readout.

6-38. Theory of Operation

6-39. A schematic diagram of the 80RF-1 High Frequency probe is given in Figure 6-10. Capacitor C1 is used as a dc blocking capacitor, diode CR1 is used as a detector, and resistors R1, R2, R3 and R_{in} form a divider network. During the negative half cycle of the ac input voltage, C1 charges through CR1 to the negative peak value of the input signal. This negative charge path provides the zero reference for the dc output signal. During the positive half cycle of the input signal the charge on C1 is added to the peak value of the positive input to produce a positive peak-peak voltage at the junction of C1 and CR1. The divider network scales this voltage to provide a dc output voltage which is equal to the rms value of the input signal.

6-40. Diode CR2 compensates for the non-linearity of the detector, and R3 is a selected part having a value of 50 kΩ to 100 kΩ.

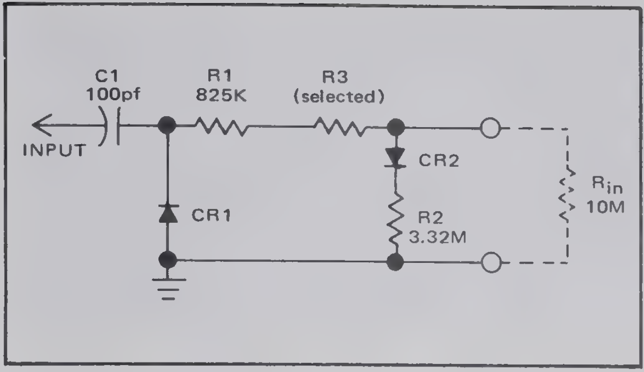


Figure 6-10. 80RF–1 SCHEMATIC

6-41. Maintenance

6-42. PERFORMANCE TEST

6-43. The low and high frequency tests given below are used to verify the ac-to-dc transfer accuracy of the 80RF-1 High Frequency Probe.

6-44. Low Frequency Response

6-45. Connect equipment as shown in Figure 6-11, and perform the following steps.

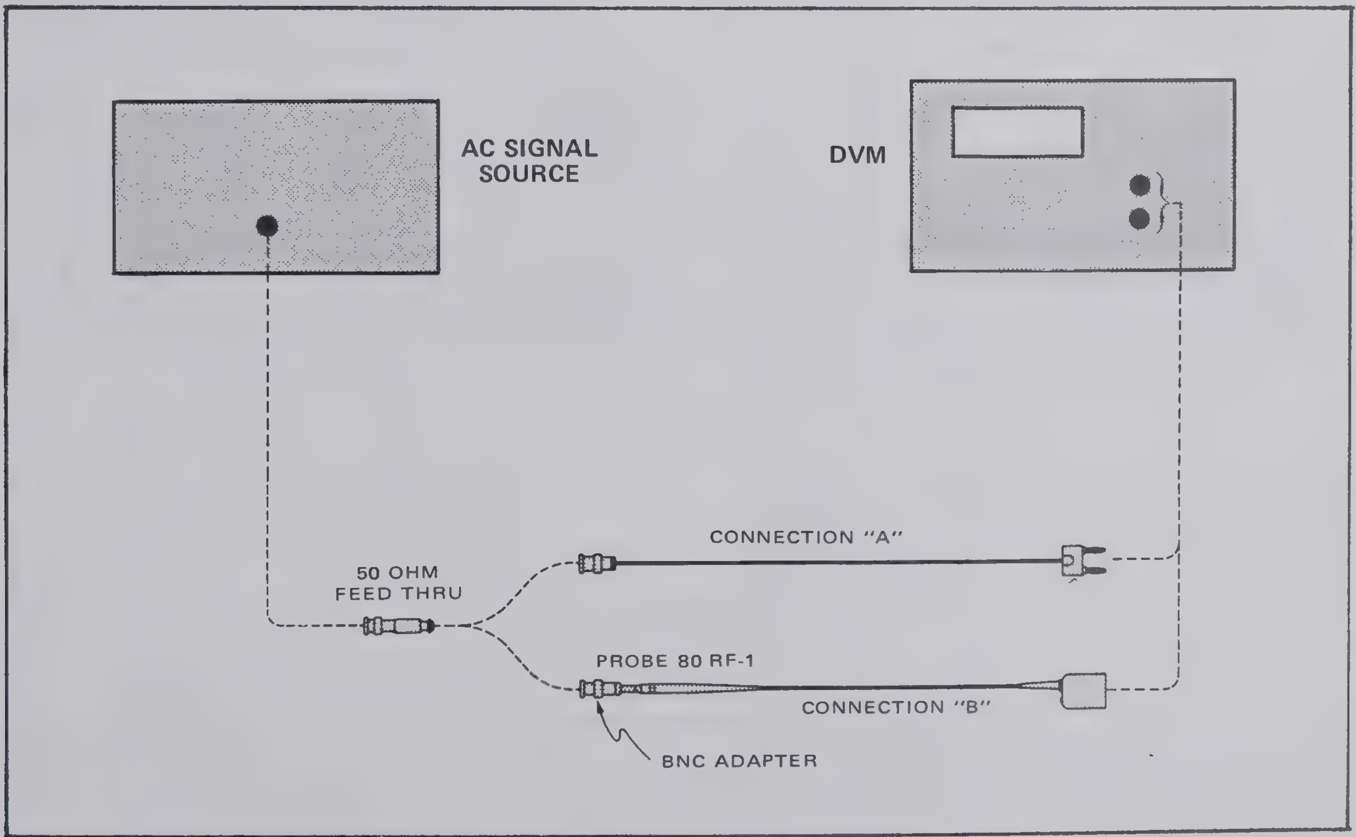


Figure 6-11. LOW FREQUENCY RESPONSE CHECK

a. With equipment as shown in connection "A" adjust the ac signal source for an output of 3.000V rms at 100 kHz as measured on the DVM.

b. In connection "B" with the DVM set to measure V dc, observe a probe output of 3.15 to 2.85V dc.

c. Placing cables back in connection "A", decrease the ac signal source by 10 db (0.95V rms).

d. Moving back to connection "B", observe a voltmeter indication of between 1.00 and 0.90V dc (10 db down from 3.0V dc).

e. In connection "A", decrease the ac signal source an additional 10 db (to 0.3V rms) as indicated by the voltmeter in its ac function.

f. Back to "B", observe a voltmeter reading of .315 to .285V dc.

g. Return the ac signal source back to 3.000V rms.

h. Repeat steps a through g with frequencies of 500 kHz, 1 MHz, and 10 MHz.

6-46. High Frequency Response

6-47. Connect equipment to the 80RF–1 probe as shown in Figure 6-12, and perform the following steps:

a. Set the ac signal source to 100 MHz with an output level of 10 milliwatts as indicated on the power meter. Ensure that the ac signal source has stabilized at the 10 milliwatt output.

b. Observe that the voltmeter indication is between 0.757 and 0.657V dc, (0.707V dc corresponds to 10 milliwatts into 50 ohms.)

c. Repeat the above for frequencies of 200 MHz, 300 MHz, 400 MHz, and 480 MHz.

6-48. CALIBRATION

6-49. Should the 80RF–1 require recalibration, perform the following steps:

a. Perform steps a and b in paragraph 6-44, with a frequency of 1 MHz.

b. Observe the dc voltmeter; a reading below 3V dc calls for a decrease in the value of R3, a reading above 3V dc calls for an increase in R3. Resistor R3 should be a 1/8W metal film type. In a probe that is working properly, a 30 kΩ change in R3 will produce about a 1% deviation in the reading.

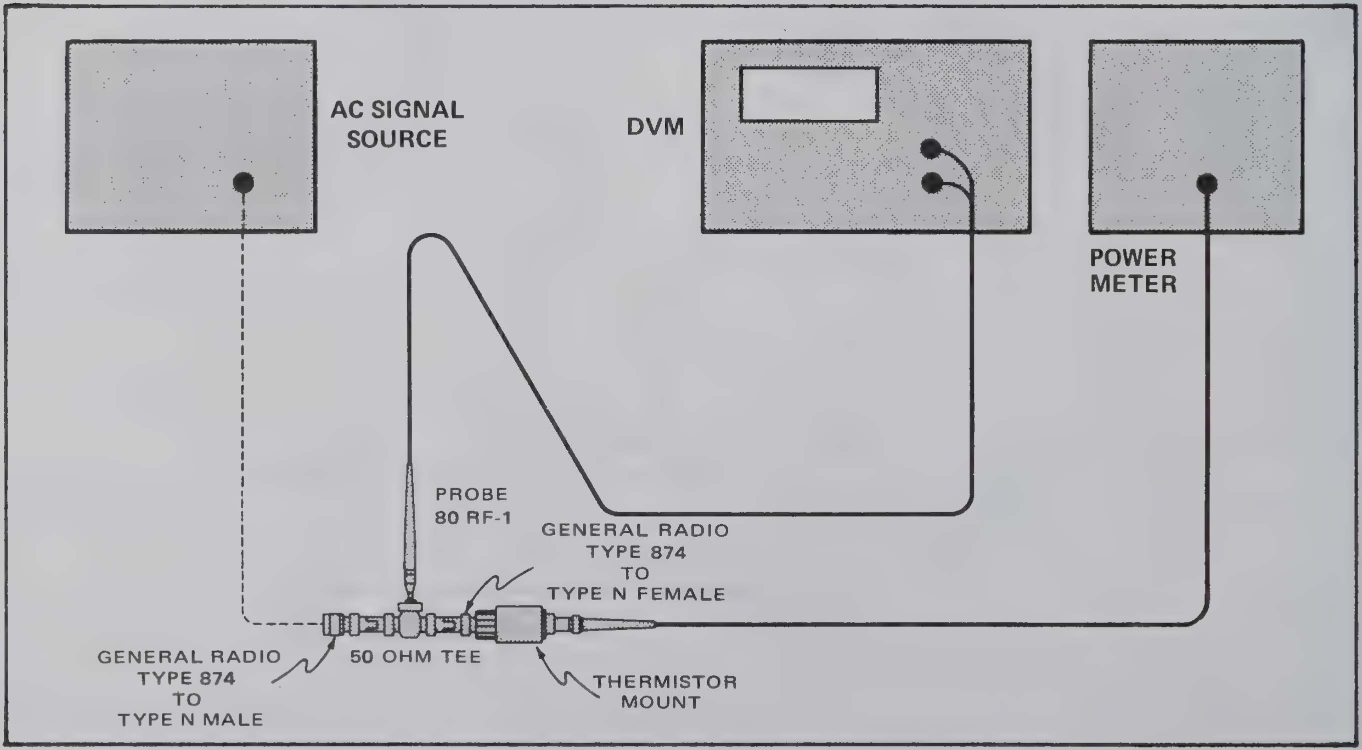


Figure 6-12. HIGH FREQUENCY RESPONSE CHECK

6-50. HIGH FREQUENCY PROBE (81RF)

6-51. Introduction

6-52. The Model 81RF High Frequency Probe, Figure 6-13, extends the frequency range of the 8000A to include 100 kHz to 100 MHz for ac voltage measurements from 0.25 to 30V rms. The 81RF operates in conjunction with the dc voltage ranges, and is connected to the 8000A using a shielded dual-banana plug and an adapter.

6-53. Specifications

Transfer Accuracy:	±1 dB from 100 kHz to 100 MHz
Voltage Range:	.25V rms to 30V rms (operated into a 10 MΩ input resistance voltmeter). Peak responding calibrated to read rms value of a sinewave.
Maximum DC Input:	350V
Input Impedance:	12MΩ shunted by ≈ 15 pf maximum

6-54. Operation

6-55. Use the following procedure for operating the 8000A with the 81RF probe:

a. Connect the 81RF shielded dual-banana plug to the 8000A V-Ω and COMMON INPUT terminals.

b. Attach the desired probe tip to the probe body.

c. Depress the DCV pushbutton (FUNCTION)

d. Select the desired voltage range.

e. Connect the probe's ground lead to a suitable ground.

f. Touch the probe tip to the circuit point to be measured.

g. Observe the voltage reading displayed in volts rms on the 8000A readout.

6-56. BATTERY PACK, OPTION –01

6-57. Introduction

6-58. The Battery Pack provides the 8000A with the capability of operating as a portable (battery-operated) in-

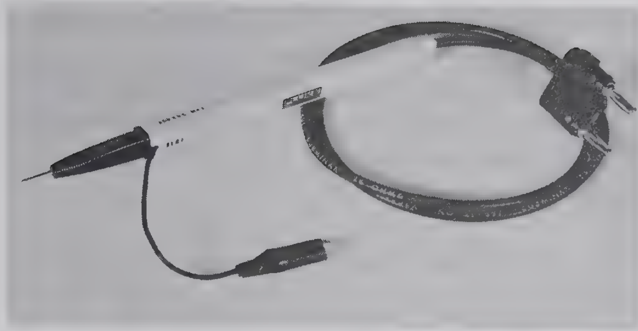


Figure 6-13. HIGH FREQUENCY PROBE (81RF)

strument. Four nickel cadmium (Ni-cad) batteries allow at lease 8 hours of portable operation before recharging is necessary. The batteries are recharged by connecting the 8000A to the ac power line. If desired, the 8000A can be operated during the charging process, however, the charging time will be increased.

6-59. Specification

6-60. The specifications for the Battery Pack are given in Section 1 of this manual.

6-61. Operation

CAUTION!

Damage may result if alkaline, zinc-carbon, or mercury batteries are charged in the 8000A.

6-62. With a fully charged Battery Pack, the 8000A can be disconnected from line power and operated for at least 8 hours, as a portable instrument. When the display digits are too dim to read, the Battery Pack should be recharged by switching the POWER switch to OFF and connecting the instrument to the ac power line. The total charge time is approximately 13 hours. If desired, the 8000A can be operated during the charging process, however, the charge time will be extended to approximately 43 hours.

NOTE

Battery manufacturers recommend that Ni-cad batteries be recharged at least every 90 days. Storage temperatures below +25°C are recommended.

6-63. Theory of Operation

6-64. The 8000A equipped with the Battery Pack Option (–01) uses the battery operated power supply shown in schematic drawing 8000A–1011. With the POWER switch ON, the batteries are connected to the input of a dc-to-dc converter which consists of Q22, Q23, T2, CR15 through

CR18, C17 and C18. Transistors Q22 and Q23, and transformer T2 form a 4 kHz multivibrator whose output signal is coupled by T2 to the diode rectifiers CR15 through CR18. Capacitors C17 and C18 filter the rectified voltage to supply the $\pm$15V dc outputs. The unregulated +5V dc is supplied by the battery.

6-65. The battery is charged whenever the instrument is connected to ac line power. Transformer T1, CR13, and CR14 provide the rectified charging voltage. Lamp, D5, in parallel with R21 acts as a dynamic current control which limits the charging current to approximately 450 mA. With the instrument connected to line power and the POWER switch OFF, approximately 425 mA can be supplied to a discharged battery.

6-66. Maintenance

6-67. BATTERY REPLACEMENT

6-68. Use the following procedure for removing and replacing batteries:

CAUTION

Do not attempt to charge alkaline, zinc-carbon or mercury batteries in the 8000A.

a. Disconnect line cord. Remove retaining screw at rear of instrument case, and remove instrument from case.

b. On the underside of the pcb, remove the two threaded bolts securing the battery holders.

c. Remove the holder tops and batteries.

d. Replace the batteries with 1.2 volt nickel-cadmium batteries (JF Part No. 346924). Install the batteries in the direction indicated by the polarity markings on the battery holder.

6-69. FUSE REPLACEMENT

6-70. The input power fuse F1 is located on the interior of the instrument near the power transformer. If replacement is necessary, use an MDL 1/8A (slo-blo) for battery powered instruments.

CAUTION!

Line potential exists on the fuseholder whenever the instrument is plugged into the line.

6-71. DIGITAL PRINTER OUTPUT UNIT (OPTION –02)

6-72. Introduction

6-73. The Digital Printer Output Unit (DPOU) provides digital measurement information to a rear panel output connector for use in controlling a remote instrument. The output data is in parallel bcd format and is compatible with the Fluke Model 2010A Digital Printer

6-74. Specifications

6-75. The specifications for the DPOU are given in Section 1 of this manual.

6-76. Operation

6-77. INPUT/OUTPUT DATA

6-78. The input/output data available at the rear-panel DPOU connector is listed in Table 6-4. The pin assignments and logic level requirements for each signal are also given.

CAUTION

Logic Common, pin 16, is connected to the 8000A's LO INPUT terminal. Ground conflicts between measurement and interface equipment can cause sever damage to the instruments involved.

6-79. DATA UPDATE

6-80. The DPOU output can be updated by either a Data Update pulse or a Continuous Update command. The Data Update pulse, pin 15, should be a negative-going input pulse which is greater than 10 μs wide. Measurement data accumulated by the 8000A, after a Data Update pulse is received, will not appear at the DPOU connector. However, the new data will be displayed. The maximum allowable rate of the Data Update pulse is three times per second. The Continuous Update command, pin 17, when held low, will cause the DPOU output to be updated at the internal trigger rate of the DPOU; typically six times per second.

6-81. BUSY FLAG

6-82 The updating period of the DPOU is signified by a Busy Flag output at pin 13 of the DPOU connector. During this period all external Data Update pulses are ignored. A simple modification on the DPOU PCB Assembly allows the Busy Flag to be inverted for use as a ready flag. Use the following procedure to modify the Busy Flag:

Table 6-4. INPUT/OUTPUT DATA AVAILABLE AT DPOU CONNECTOR

PIN NO	SIGNAL		LINES	SIGNAL LOGIC HIGH =	SIGNAL LOGIC LOW =	LOGIC LEVELS "1" =	LOGIC LEVELS "0" =
2		Most significant digit (MSD)	1	1	0	+4.3 to +5.7V dc	0 to +0.4V dc
10	8	2 MSD	4	8	0		
11	4			4	0		
12	2			2	0		
4	1			1	0		
19	8	3 MSD	4	8	0		
3	4			4	0		
6	2			2	0		
14	1			1	0		
18	8	Least Significant Digit (LSD)	4	8	0		
7	4			4	0		
20	2			2	0		
9	1			1	0		
8		Polarity	1	+	–		
5		Display overload	1	Overload	no Overload		
13		Busy Flag	1	Busy	Not Busy		
15		Data Update Pulse (⩾ 10μs)	1	–	Update	Open or +5V dc	0 to +0.4V dc or contact closure to Common
17		Continuous Update Command	1	–	Update		
16		Logic Common	1				
1		+5V dc through 15kΩ	1				

a. Disconnect the line power cord.

b. Remove the retaining screw at the rear of the 8000A case.

c. Separate the instrument from the case.

d. Locate the DPOU PCB Assembly.

e. Refer to the DPOU schematic and remove jumper wire J1.

f. Install jumper wire J2.

g. Install the 8000A in its case.

6-83. DATA OUTPUT PULLUP VOLTAGE

6-84. Normally the output data lines at the DPOU connector are pulled-up through 15kΩ resistors to the +5V dc logic supply. A simple jumper modification on the DPOU PCB Assembly allows an external pull-up voltage (+15V dc maximum) to be applied at pin 1 of the DPOU Connector. Use the following procedure to incorporate the external pullup voltage feature:

a. Disconnect the line power cord.

b. Remove the retaining screw at the rear of the 8000A case.

c. Separate the instrument from the case.

d. Locate the DPOU PCB Assembly.

e. Refer to the DPOU schematic drawing, 8000A–1012, and remove jumper wire J3.

f. Install jumper wire at J4.

g. Install the 8000A in its case.

6-85. DPOU INTERFACE CABLE

6-86. A mating DPOU connector is supplied as part of the –02 option for use in fabricating a custom interface cable. Use the following procedure to fabricate the interface cable:

a. Assemble the following equipment:

1. Teflon or vinyl insulated wire, 26 gauge, 20 pieces cut to desired length.
2. Sleeving, # 16 for vinyl insulated wire, or #18 for teflon insulated wire.
3. Rosin core solder, 60/40
4. Wire strippers
5. Soldering Iron, pencil-type (45W max.)
6. DPOU mating connector
7. Mating connector for interfaced instrument
8. Connector vice

b. Slide cable wires through the DPOU connector backshell (hood) as shown in Figure 6-14.

c. Strip one-eight of an inch of insulation from the DPOU connector end of the cable. Tin the ends.

d. Cut 20 pieces of sleeving to a length of three-sixteenths of an inch.

e. Slide one piece of sleeving over each prepared wire end.

f. Place the DPOU mating connector in the connector vice, and tin each connector pin.

g. Solder one prepared wire to each connector pin.

h. Position the sleeving over the solder joints, and install the connector backshell (hood) and strain relief as shown in Figure 6-14.

i. Install the wires on the mating connector for the interfaced instrument using the DPOU connector information given in Table 6-4 and Figure 6-15.

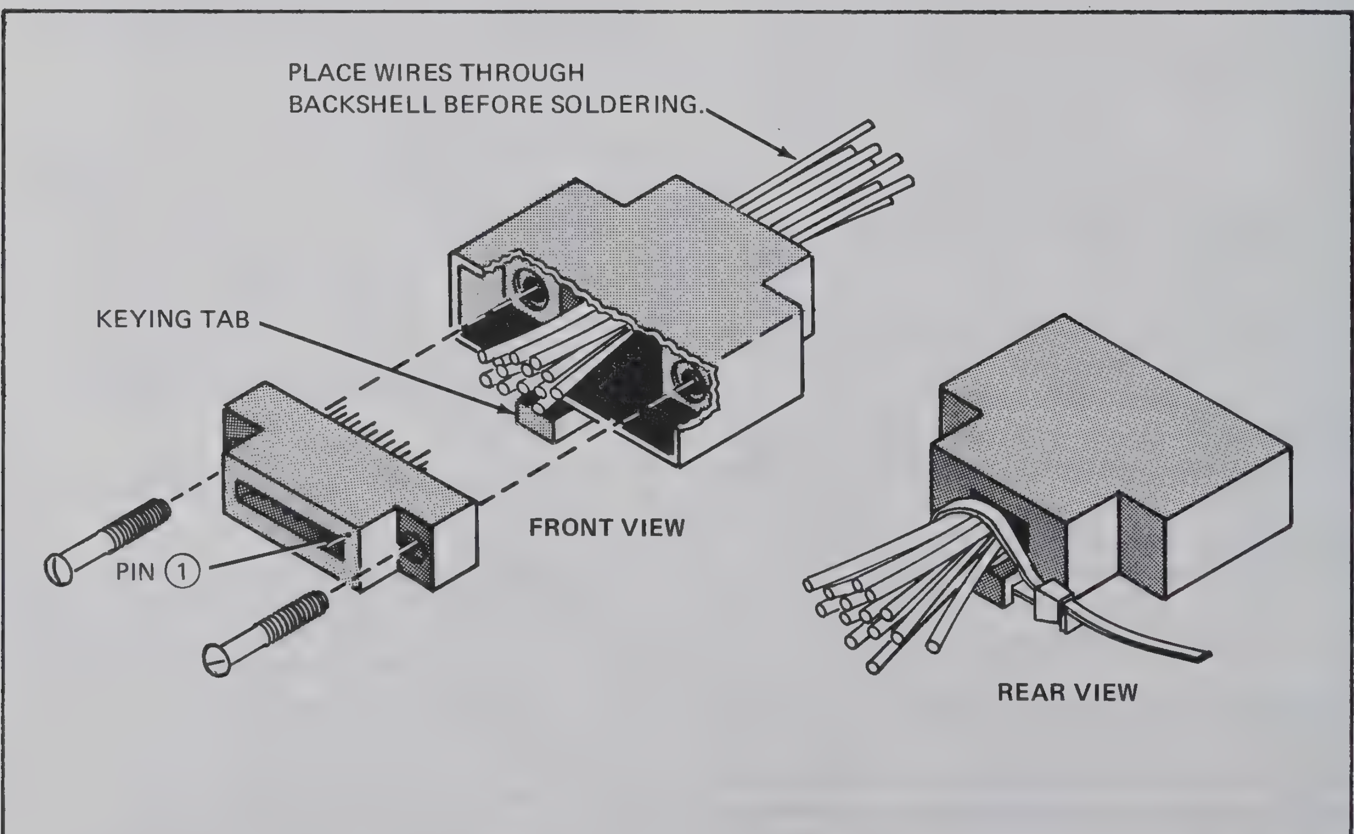


Figure 6-14. MATING CONNECTOR END OF THE DPOU INTERFACE CABLE

6-87. Theory of Operation

6-88. The DPOU consists of a series of shift registers which, when enabled, store the character serial measurement data generated by the 8000A. The storage process is enabled by an external update command, and is synchronized with the 8000A display strobe lines, S1 through S4. The shift registers retain the solicited data until a new update command is received. The stored parallel bcd measurement data, available at the shift register outputs, is buffered before being made available at the DPOU connector.

6-89. Numeric, polarity, and overload data from the 8000A is applied in character serial format to the input lines (W, X, Y and Z) of the DPOU. The serial sequence is controlled by the strobe lines (S1 through S4), and during period S1, the most significant digit (0 or 1), the display overload signal, and the polarity bit are present at the shift register input. During strobe periods S2, S3 and S4 the shift registers are presented with the second, third, and fourth measurement digits, respectively. Data is loaded into the shift registers by a clock pulse which is synchronized with the strobe pulses, S1 through S4.

6-90. The data update sequence is initiated when the Data Update line is pulled low. When the next positive transition of the T input occurs (see Figure 6-16) the Q output of flip-flop U1-1 is set high. When set, U1-1 enables a second flip-flop to set on the appearance of the S1 (strobe line) pulse. After the second flip-flop is set, the Busy Flag is generated and, the shift registers enter the character-serial data present on the W, X, Y, and Z inputs. Upon detecting the S4 input, flip-flop U1-1 is reset and on the completion of the subsequent clock pulse the second flip-flop is reset. The Busy Flag drops low to indicate the completion of the data update sequence.

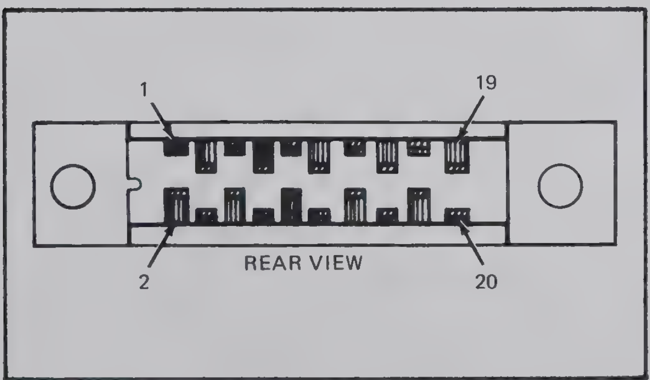


Figure 6-15. DPOU MATING CONNECTOR DETAIL

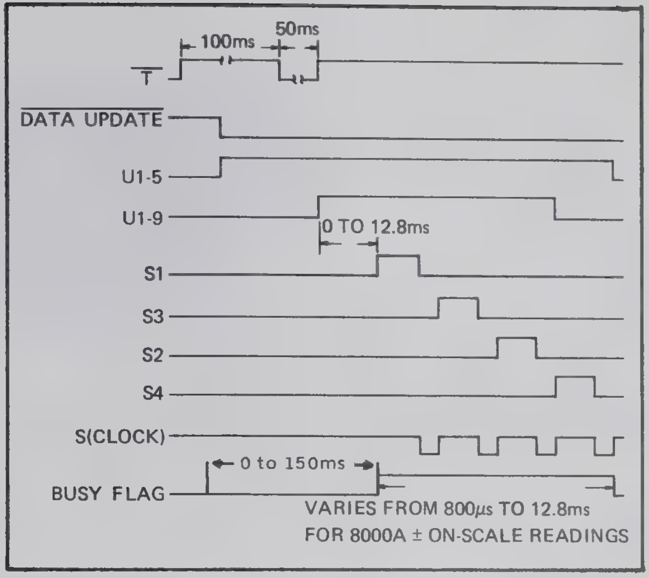


Figure 6-16. DPOU TIMING DIAGRAM

6-91. 10A CURRENT RANGE, OPTION –05

6-92. Introduction

6-93. The 10A Current Range, Option –05, extends the current measuring capability of the 8000A to include a 10A current range. With the Option –05 installed, the 8000A is capable of making continuous current measurements up to 10A and periodic current measurements from 10A to 20A. Current measurements in excess of 10A are limited to periods of less than 1 minute and a duty cycle of 25%. The standard operating characteristics of the 8000A are not altered by the installation of this option.

6-94. Specifications

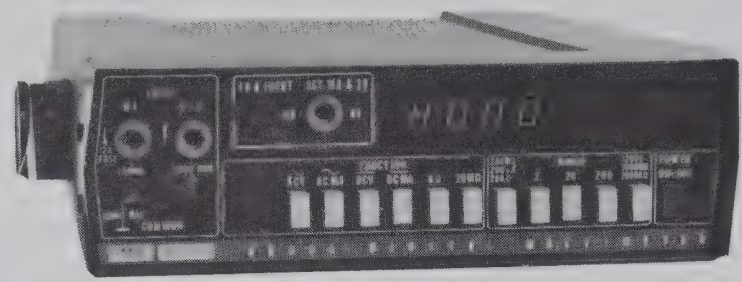
6-95. The specifications for the 10A Current Range are given in Section 1 of this manual.

6-96. Operation

6-97. Instructions for properly conditioning the front panel switches, and the Input connections for a current measurement on the 10A range are given in Figure 6-17.

6-98. Theory of Operation

6-99. The 10A Current Range as shown in Figure 6-18, consists of a 0.01 ohm resistor which is inserted in a low sense line of the current shunt circuit. Separate input terminals eliminate the need for additional range switching. The decimal point is properly positioned in the readout by depressing the 20 RANGE pushbutton.



DESIRED MEASUREMENT	SELECT FUNCTION	SELECT RANGE	MEASUREMENT INPUT CONNECTORS	MEASUREMENT PERIOD
2 to 20A dc	DC MA	20	Hi and LO 10A Inputs	Continuous to 10A. Above 10A, 1 minute or less (25% duty cycle)
2 to 20A ac	AC MA	20	HI and LO 10A inputs	

Figure 6-17. OPTION –05, MEASUREMENT INSTRUCTIONS

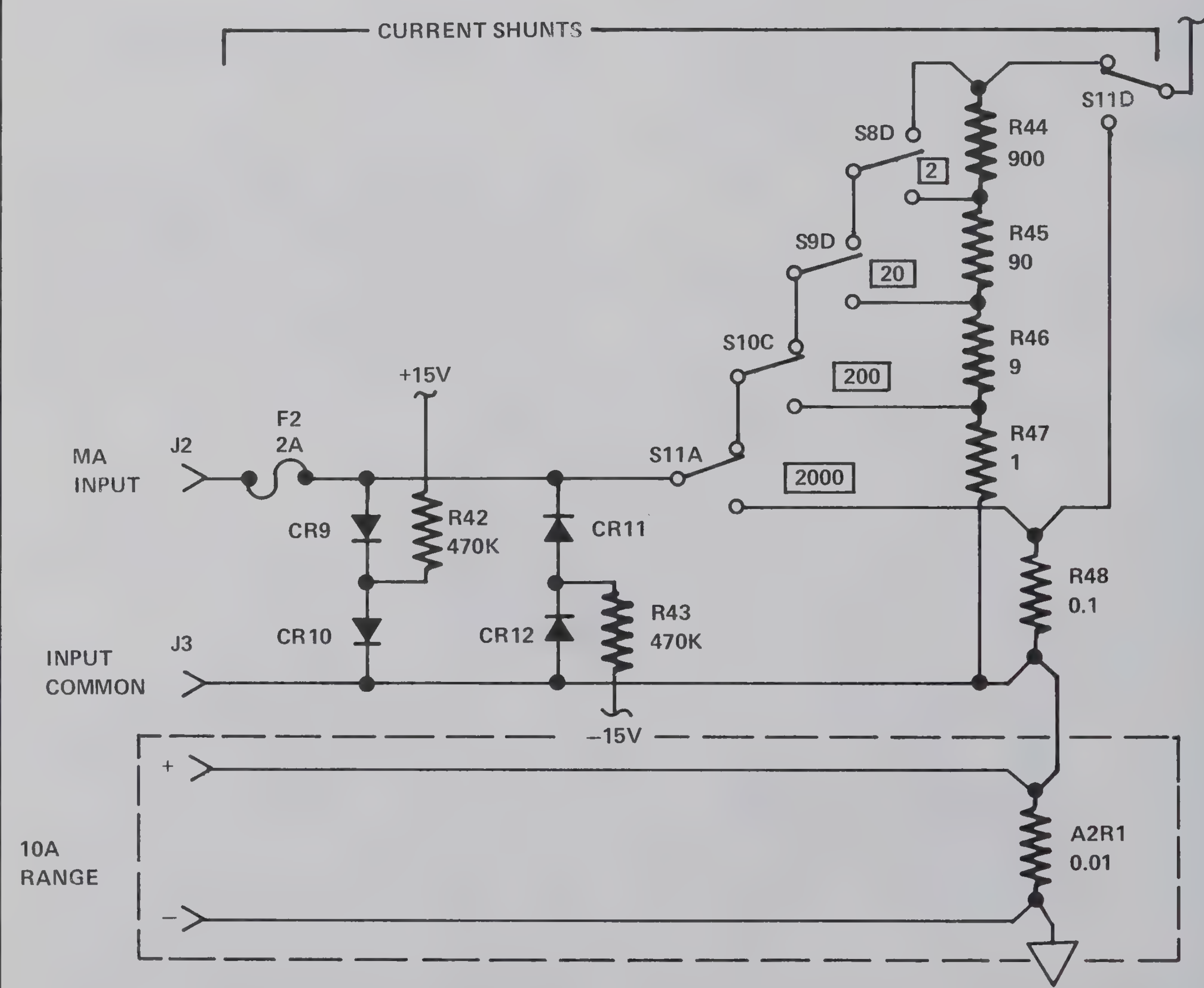


Figure 6-18. OPTION –05, SCHEMATIC DIAGRAM

6-100. LOW OHMS OPTION (–06)

6-101. Introduction

6-102. The Low Ohms Option (–06) provides the 8000A with both a 2 and 20 ohm full scale range. The option includes a separate set of front panel input terminals and an adjustment to null out the presence of test lead resistance. All standard 8000A features, with the exception of the 20 MΩ range, are maintained when the –06 options is installed. The 20 MΩ FUNCTION switch is deleted and replaced with a LO Ω FUNCTION switch.

6-103. Specifications

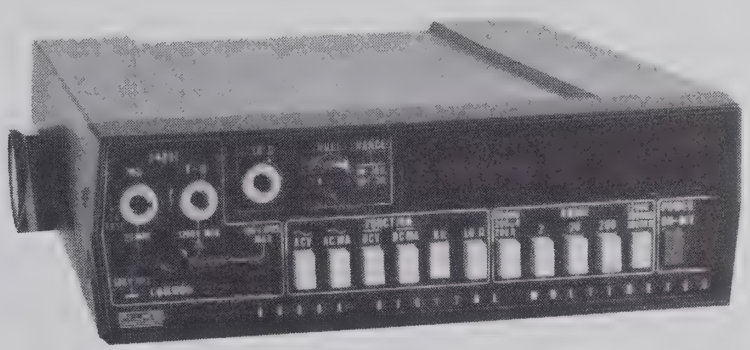
6-104. The specifications for the Low Ohms Option are given in Section 1 of this manual.

6-105. Operation

6-106. Instructions for conditioning the front panel switches, and completing the input connections necessary for a resistance measurement on the low ohm ranges are given in Figure 6-19.

NOTE

The test leads supplied with the 8000A should be used for low ohms measurements. Any leads used as substitutes should have a resistance of from 60 to 140 milliohms (lead resistance for a five foot pair of #20 wire is 100 milliohms).



DESIRED MEASUREMENT	SELECT FUNCTION	SELECT RANGE	MEASUREMENT INPUT CONNECTORS	NULL ADJUSTMENT
0 to 2Ω	LOΩ	2Ω (OUT)	LOΩ and COMMON	Prior to measurement, touch test leads together and adjust NULL control for an all zero reading.
2 to 20Ω	LOΩ	20Ω (IN)	LOΩ and COMMON	

Figure 6-19. OPTION –06, MEASUREMENT INSTRUCTIONS

Section 7

Schematic Diagrams

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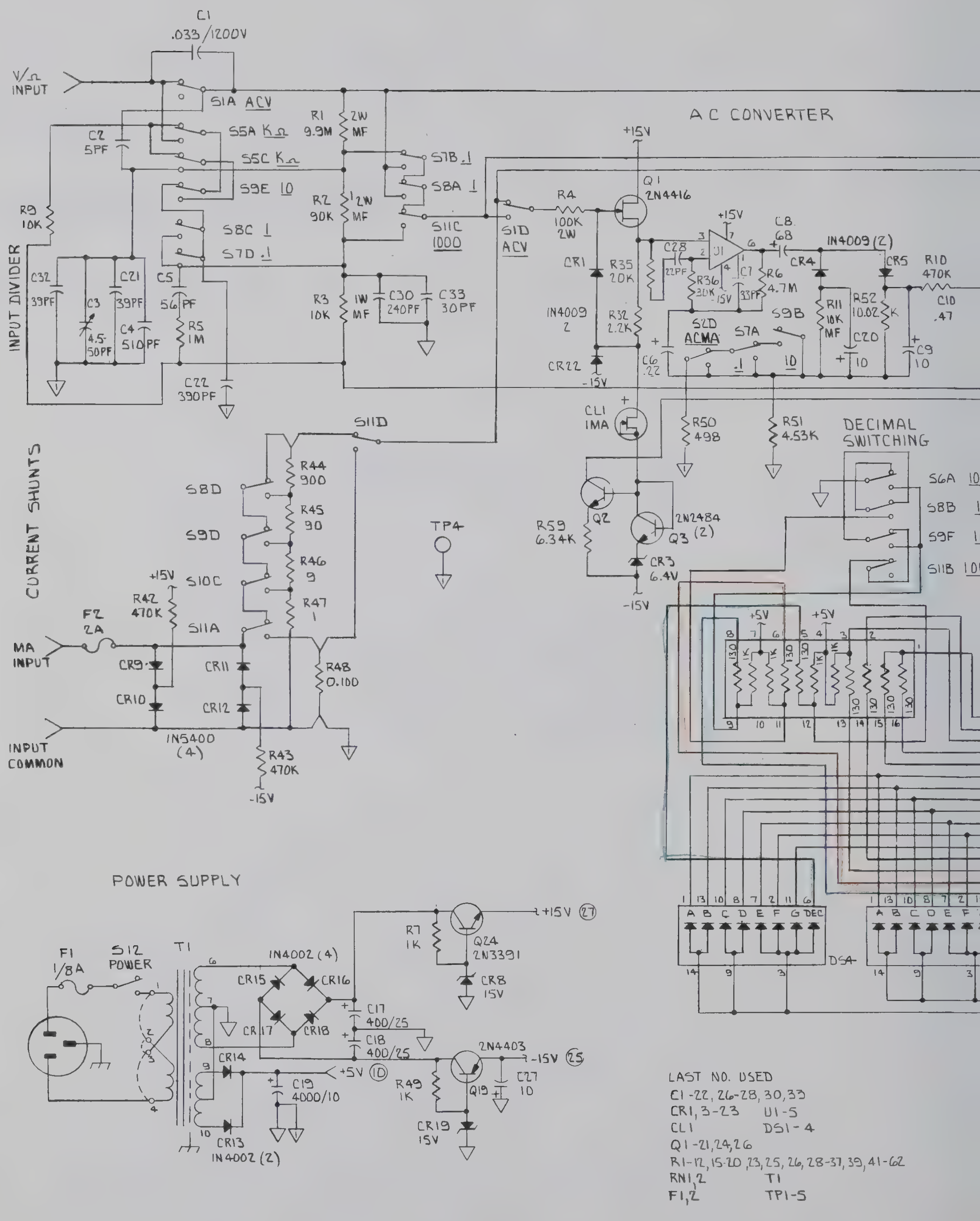
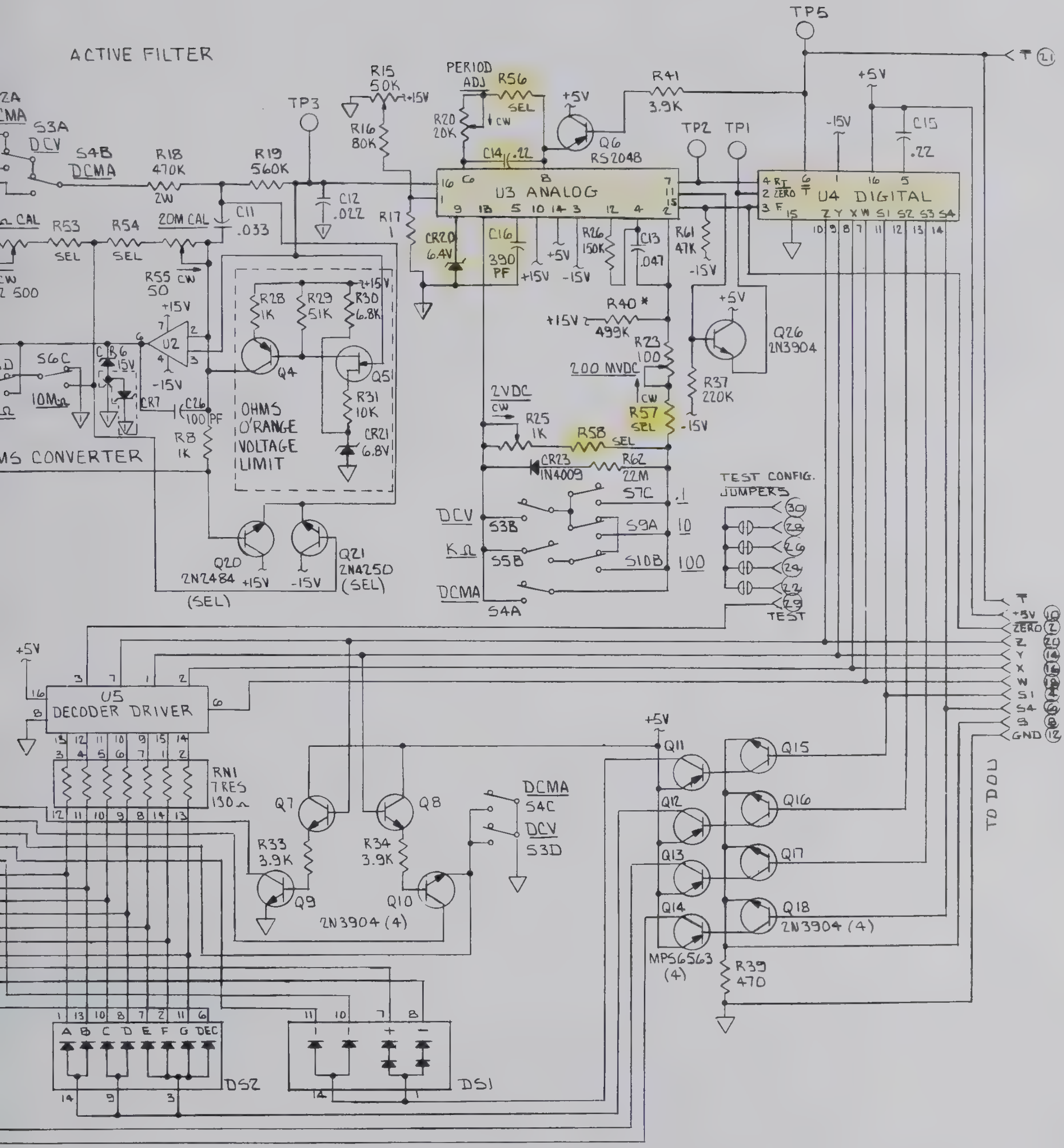
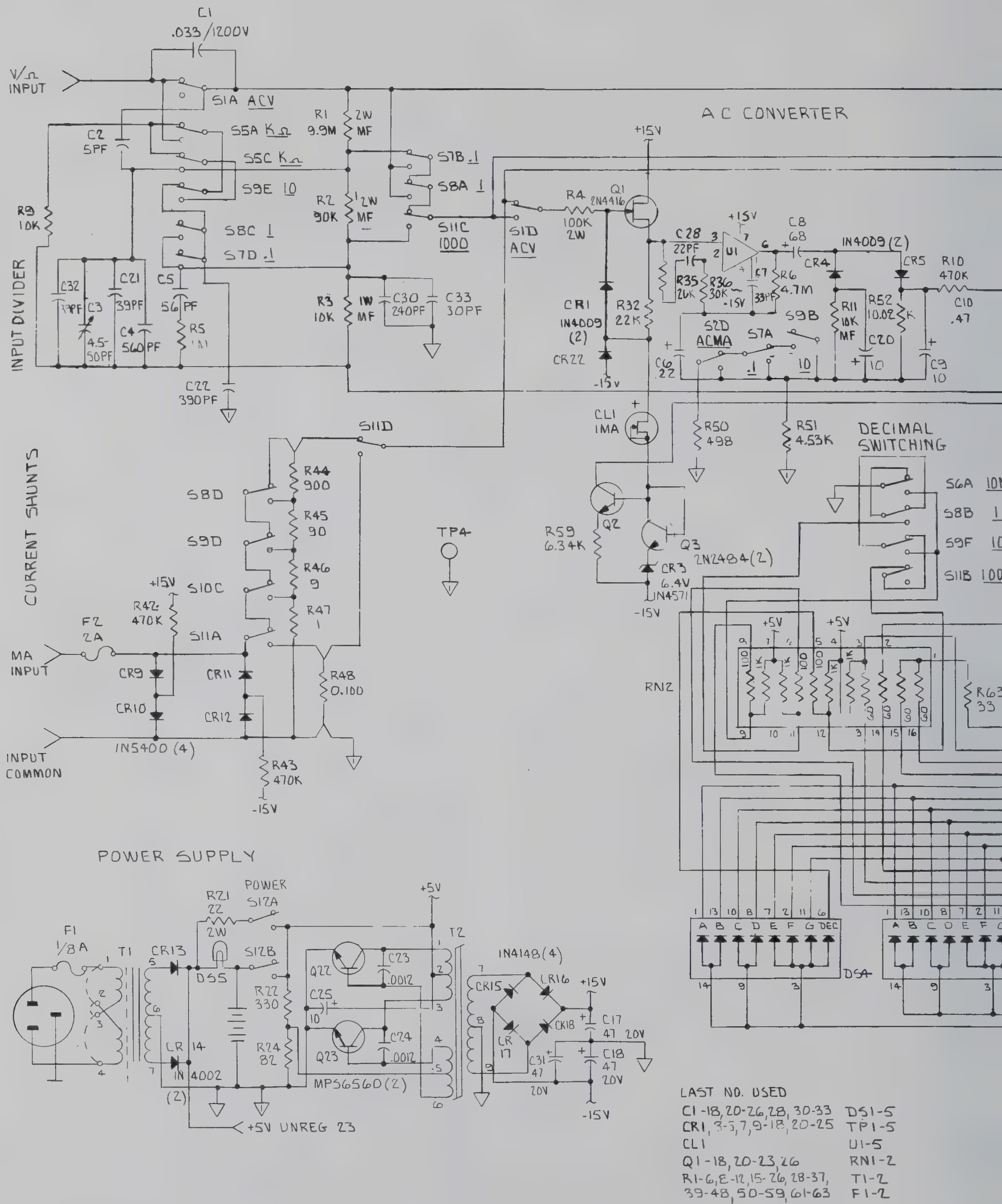
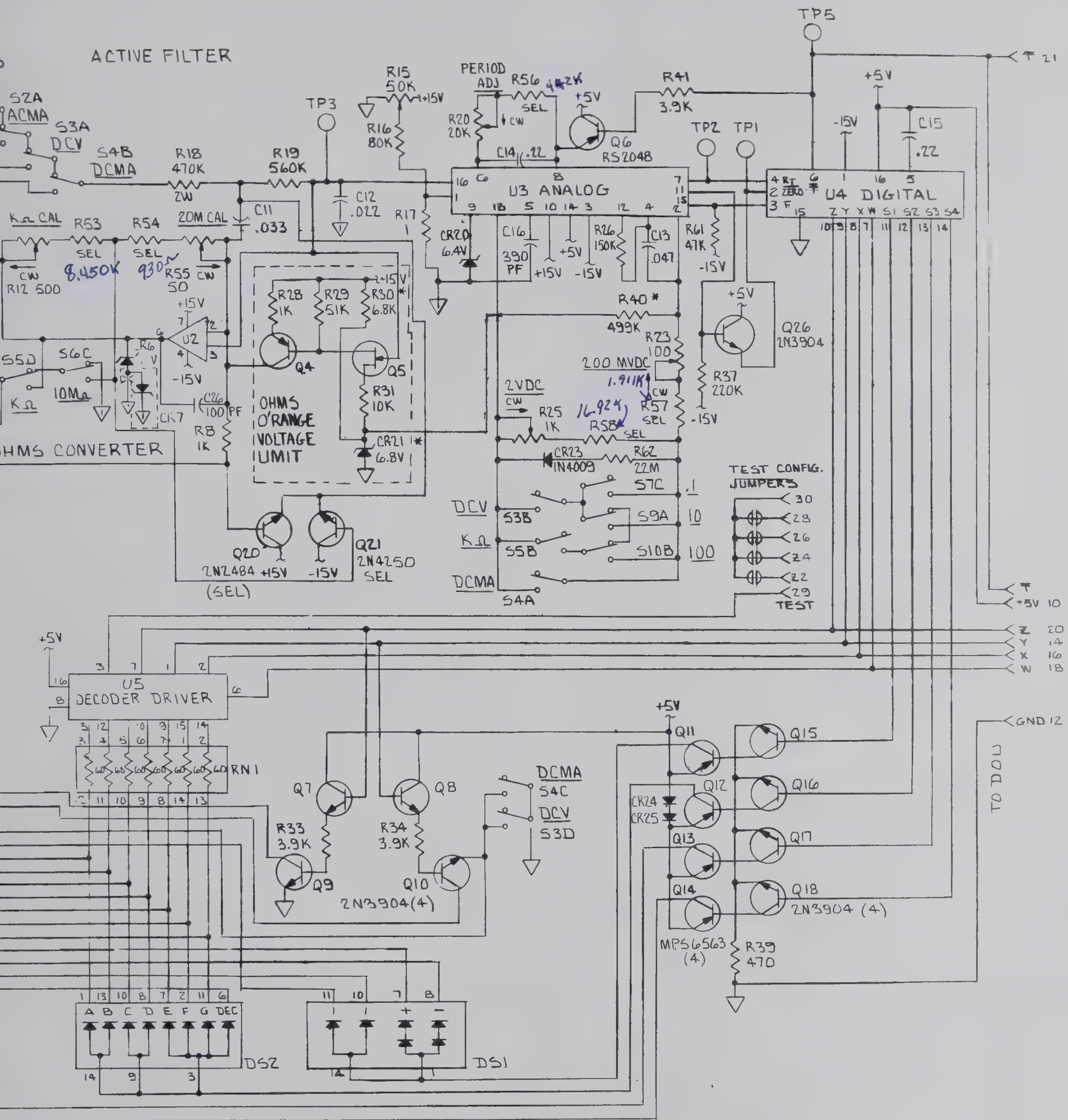

C1
.033/1200V
V/Ω
INPUT
S1A ACV
S5A KΩ
S5C KΩ
S9E 10
S8C 1
S7D .1
C2
5PF
R9
10K
INPUT DIVIDER
C32
39PF
C3
4.5-50PF
C21
39PF
C4
510PF
C5
56PF
R5
1M
C22
390PF
R1
9.9M
2W
MF
R2
90K
2W
MF
R3
10K
1W
MF
C30
240PF
C33
30PF
S7B .1
S8A 1
S11C
1000
S1D
ACV
A C CONVERTER
+15V
Q1
2N4416
R4
100K
2W
CR1
R35
20K
1N4009
2
R32
2.2K
CR22
-15V
C28
22PF
U1
R36
30K
C7
33PF
R6
4.7M
C8
.68
CR4
1N4009 (2)
CR5
R10
470K
C10
.47
R11
10K
MF
R52
10.02K
C20
10
C9
10
C6
.22
S2D
ACMA
S7A
S9B
.1
10
CL1
1MA
R50
498
R51
4.53K
DECIMAL
SWITCHING
S6A
S8B
S9F
S11B
Q2
R59
6.34K
2N2484
Q3 (2)
CR3
6.4V
-15V
CURRENT SHUNTS
S11D
S8D
S9D
S10C
S11A
R44
900
R45
90
R46
9
R47
1
R48
0.100
TP4
+15V
R42
470K
F2
2A
MA
INPUT
CR9
CR10
CR11
CR12
INPUT
COMMON
1N5400
(4)
R43
470K
-15V
+5V
130
1K
DS4
POWER SUPPLY
F1
1/8A
S12
POWER
T1
1N4002 (4)
CR15
CR16
CR17
CR18
C17
400/25
C18
400/25
CR14
C19
4000/10
+5V (10)
CR13
1N4002 (2)
R7
1K
Q24
2N3391
CR8
15V
+15V (27)
2N4403
-15V (25)
R49
1K
Q19
C27
10
CR19
15V
LAST NO. USED
C1-22, 26-28, 30, 33
CR1, 3-23 U1-5
CL1 DS1-4
Q1-21, 24, 26
R1-12, 15-20, 23, 25, 26, 28-37, 39, 41-62
RN1, 2 T1
F1, 2 TP1-5



40 INSTALLED IN TEST
REQ'D FOR NEG TURNOVER

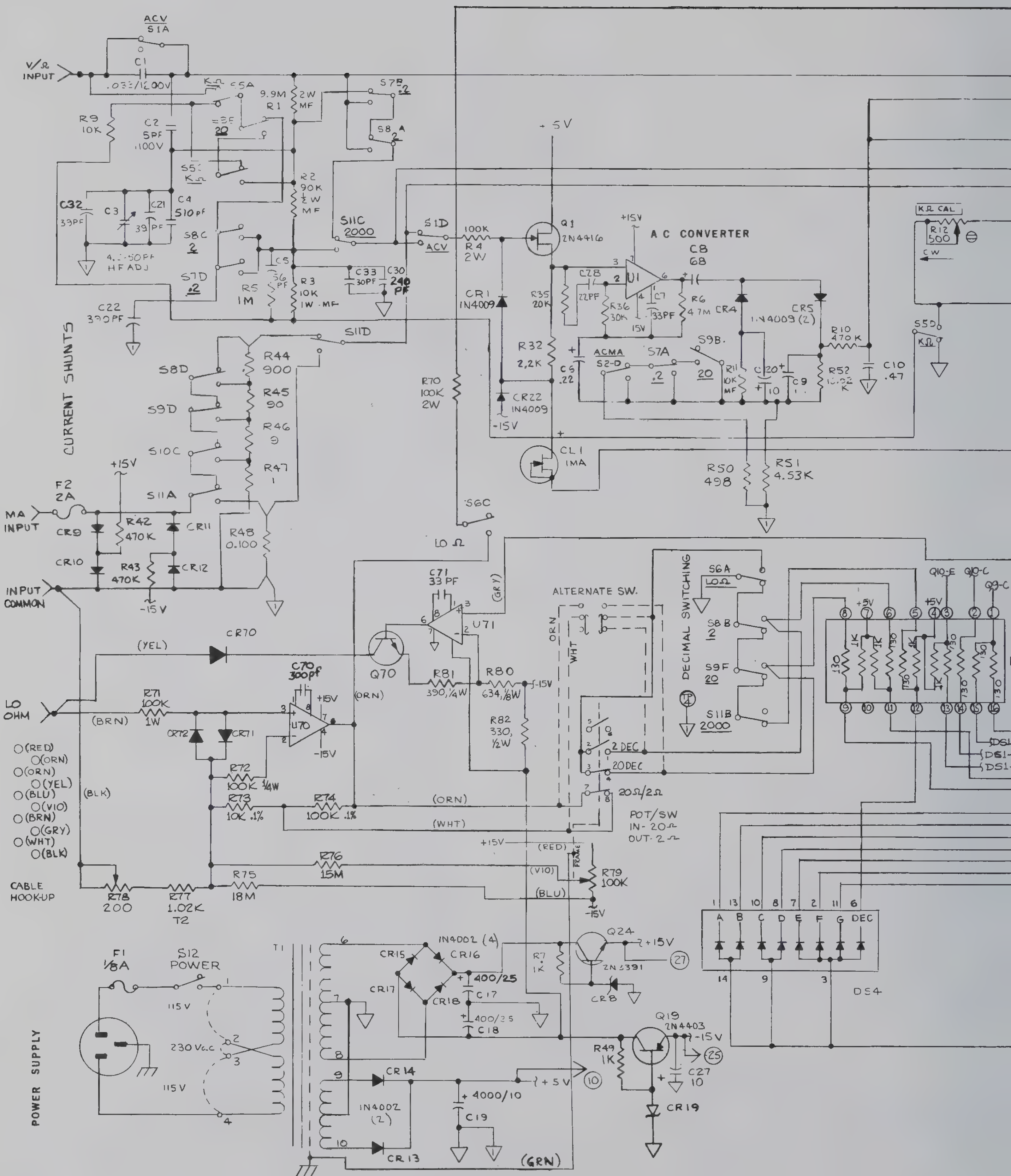
FIGURE 7-1. 3½ DIGIT MULTIMETER, LINE OPERATED (8000A-1001)


C1
.033/1200V
V/Ω INPUT
S1A ACV
S5A KΩ
S5C KΩ
S9E 10
S8C .1
S7D .1
S7B .1
S8A .1
S11C 1000
S1D ACV
R1 9.9M 2W MF
R2 90K 2W MF
R3 10K 1W MF
C2 5PF
R9 10K
INPUT DIVIDER
C32
C3 4.5-50PF
C21 39PF
C4 560PF
C5 56PF
R5 1M
C30 240PF
C33 30PF
C22 390PF
A C CONVERTER
+15V
R4 100K 2W
Q1 2N4416
CR1 IN4009 (2)
CR22
R32 22K
C28 22PF
R35 26K
R36 30K
U1
C7 33PF
R6 4.7M
C8 68
IN4009 (2)
CR4
CR5
R10 470K
C10 .47
R11 10K MF
R52 10.02K
C20 10
C9 10
C6 .22
S2D ACMA
S7A
S9B
-15V
CL1 1MA
R50 498
R51 4.53K
DECIMAL SWITCHING
S6A 10
S8B 1
S9F 10
S11B 100
Q2
Q3
2N2484 (2)
R59 6.34K
CR3 6.4V 1N4571
CURRENT SHUNTS
S11D
S8D
S9D
S10C
S11A
R44 900
R45 90
R46 9
R47 1
R48 0.100
TP4
R42 470K
F2 2A
MA INPUT
CR9
CR10
CR11
CR12
1N5400 (4)
INPUT COMMON
R43 470K
RN2
R63 33
+5V
DS4
POWER SUPPLY
F1 1/8A
T1
CR13
CR14
IN4002 (2)
R21 22 2W
POWER S12A
S12B
DS5
R22 330
R24 82
C25 10
Q22
Q23
C23 .0012
C24 .0012
MPS6560 (2)
T2
+5V UNREG 23
IN4148 (4)
CR15
CR16
CR17
CR18
C17 47 20V
C18 47 20V
C31 47 20V
LAST NO. USED
C1-18, 20-26, 28, 30-33 DS1-5
CR1, 3-5, 7, 9-18, 20-25 TP1-5
CL1 U1-5
Q1-18, 20-23, 26 RN1-2
R1-6, 8-12, 15-26, 28-37, T1-2
39-48, 50-59, 61-63 F1-2

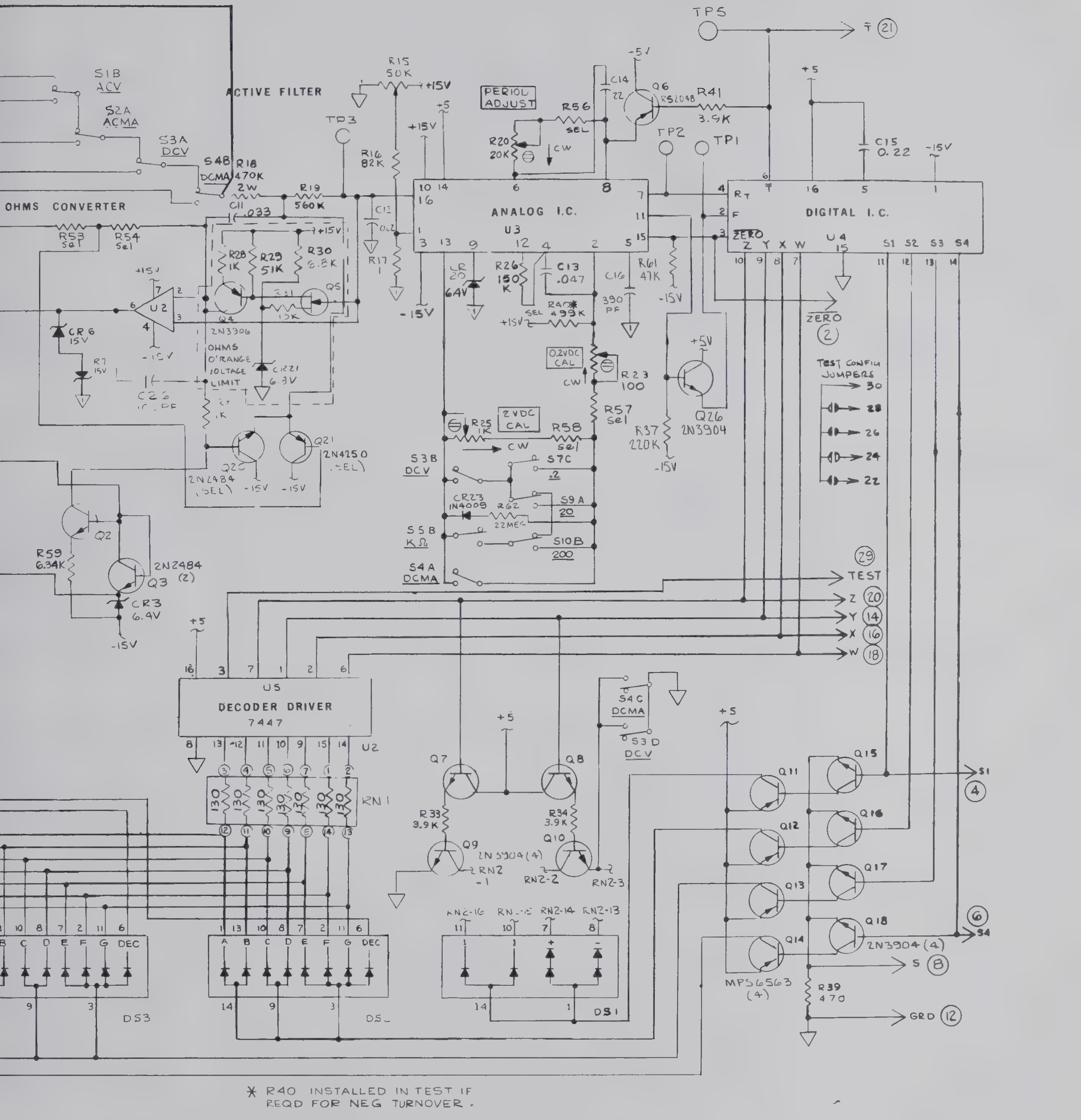


NOTE:
R30, R40 & CR21 INSTALLED IN TEST IF REQ'D FOR NEGATIVE TURNOVER

FIGURE 7-2. 3½ DIGIT MULTIMETER, BATTERY OPERATED, –01 OPTION (8000A-1011)



ACV S1A
V/Ω INPUT
C1 .033/1200V
R9 10K
C2 5PF 100V
9.9M R1
2W MF
S7B .2
S8 A 2
R2 90K ½W MF
C32 39PF
C3
C21 39 PF
C4 510 pF
4.5-50PF HF ADJ
S8C 2
S7D .2
S11C 2000
S1D ACV
100K R4 2W
Q1 2N4416
+5V
+15V
A C CONVERTER
C8 68
U1
C28 22PF
R36 30K
C7 33PF
R6 4.7M
CR4
CR5 1N4009 (2)
R10 470K
C10 .47
R52
KΩ CAL
R12 500
CW
S5D KΩ
C5
R5 1M
R3 10K 1W MF
C33 30PF
C30 240 PF
C22 390PF
CR1 1N4009
R35 20K
R32 2,2K
C6 .22
ACMA S2-D
S7A .2
S9B 20
R11 10K MF
C20 10
C9
CURRENT SHUNTS
S11D
R44 900
R45 90
R46 9
R47 1
S8D
S9D
S10C
S11A
R48 0.100
R70 100K 2W
CR22 1N4009
-15V
CL1 1MA
R50 498
R51 4.53K
MA INPUT
F2 2A
+15V
CR9
R42 470K
CR11
CR10
R43 470K
CR12
INPUT COMMON
S6C
LO Ω
C71 33 PF
U71
(GRY)
ALTERNATE SW.
DECIMAL SWITCHING
S6A LOΩ
S8 B 2
S9F 20
S11B 2000
Q10-E
Q10-C
Q9-C
CR70
(YEL)
Q70
R81 390,¼W
R80 634,⅛W
R82 330, ½W
C70 300pf
U70
(ORN)
LO OHM
R71 100K 1W
(BRN)
CR72
CR71
R72 100K ¼W
R73 10K .1%
R74 100K .1%
(WHT)
2 DEC
20 DEC
20Ω/2Ω
POT/SW IN- 20Ω OUT- 2Ω
O(RED)
O(ORN)
O(YEL)
O(BLU)
O(VIO)
O(BRN)
O(GRY)
O(WHT)
O(BLK)
(BLK)
R76 15M
R75 18M
(RED)
(VIO)
(BLU)
R79 100K
CABLE HOOK-UP
R78 200
R77 1.02K T2
DS4
F1 ⅛A
S12 POWER
115V
230 Vac
POWER SUPPLY
T1
CR15
CR16
1N4002 (4)
CR17
CR18
400/25 C17
400/25 C18
R7 1K
Q24
2N3391
+15V
CR8
Q19 2N4403
R49 1K
C27 10
CR19
CR14
+5V
4000/10 C19
1N4002 (2)
CR13
(GRN)



NOTES: (UNLESS OTHERWISE SPECIFIED)

ALL RESISTANCES IN OHMS, ALL CAPACITANCES IN MICROFARADS.

1-12, 15-26, 28 – 37, 39-62

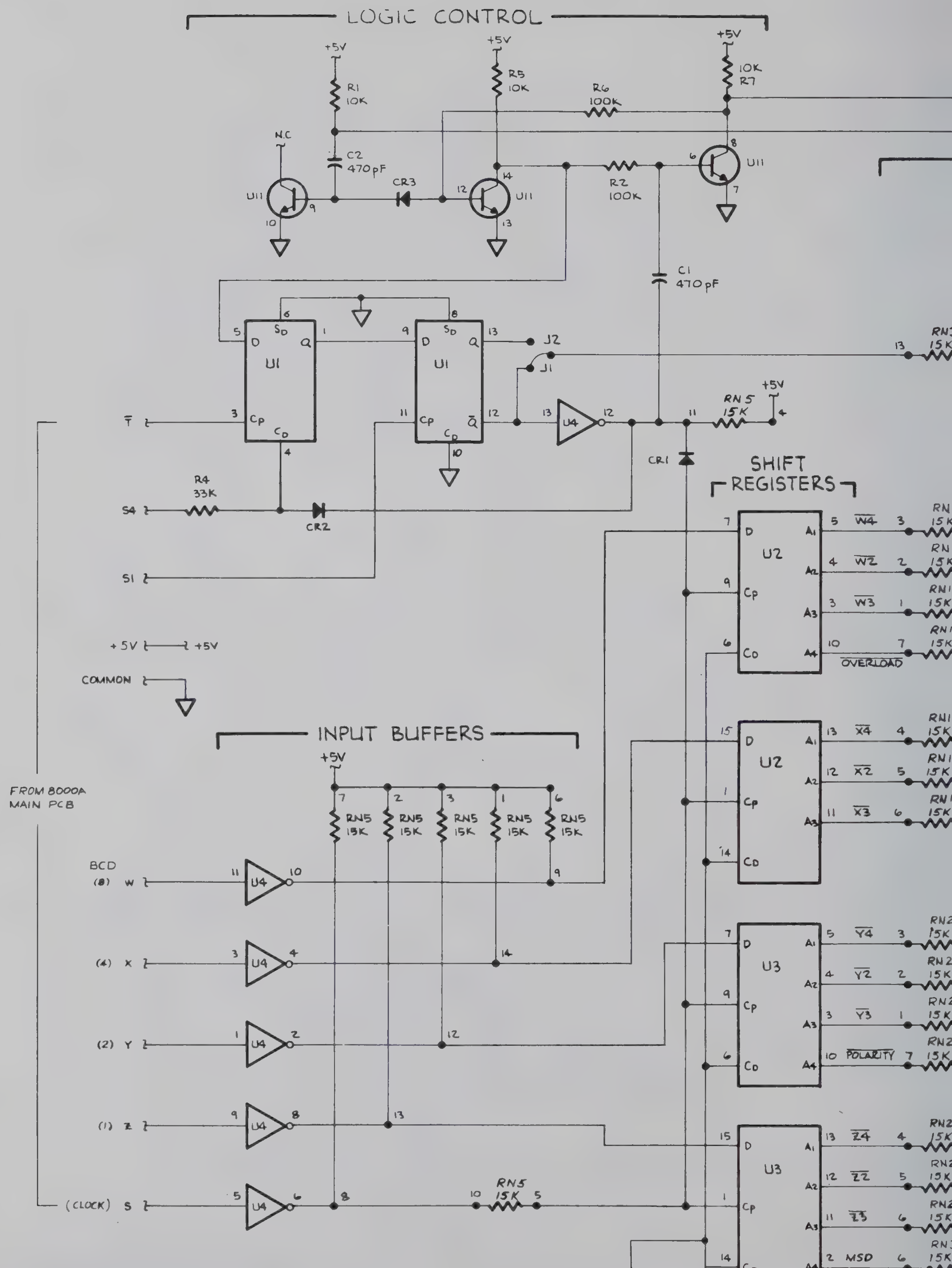
1 - 28, 32, 33 RN1, 2

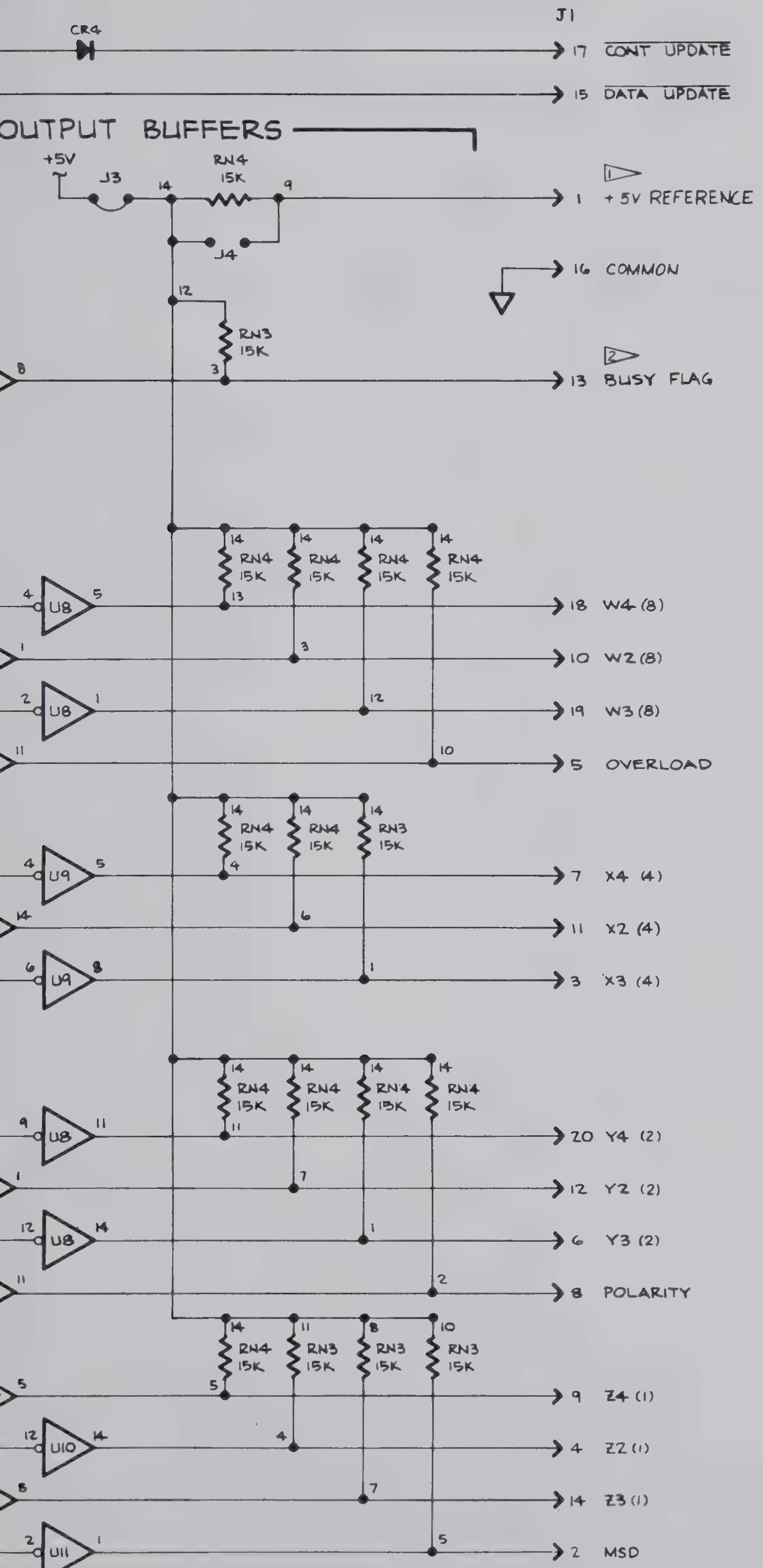
1-3, 6-24, 26

1, 3-23 CL1-2

U 1-5 DS1-5

FIGURE 7-3. 3½ DIGIT MULTIMETER, LOW OHMS, –06 OPTION (8000A-1006)


LOGIC CONTROL
SHIFT REGISTERS
INPUT BUFFERS
FROM 8000A MAIN PCB
BCD
(8) W
(4) X
(2) Y
(1) Z
(CLOCK) S
S4
S1
+5V
COMMON
OVERLOAD
POLARITY
MSD
R1 10K
R5 10K
R6 100K
R7 10K
R2 100K
R4 33K
C2 470pF
C1 470pF
CR1
CR2
CR3
U1
U2
U3
U4
U11
J1
J2
RN5 15K



NOTES:

1. ALL RESISTANCE IS IN OHMS AND ALL CAPACITANCE IS IN MICROFARADS UNLESS OTHERWISE NOTED.
2.

BCD / DIG.	8	4	2	1
2^{ND}	W2	X2	Y2	Z2
3^{RD}	W3	X3	Y3	Z3
4^{TH}	W4	X4	Y4	Z4

3. 1 MODIFIABLE FOR CONNECTION OF EXTERNAL PULL-UP VOLTAGE. SEE INSTRUCTION MANUAL, SECTION 4
4. 2 MODIFIABLE TO READY FLAG. SEE INSTRUCTION MANUAL, SECTION 4.

FIGURE 7-4. DIGITAL PRINTER OUTPUT UNIT, –02 OPTION (8000A-1012)

Appendix A

Federal Supply Code for Manufacturers

A-1. CODE TO NAME

A-2. The following five digit code numbers are listed in numerical sequence along with the manufacturer's name and address to which the code has been assigned. The Federal Supply Code has been taken from Cataloging Handbook H 4-2, Code to Name.

00213	Sage Electronics Corp., Rochester, New York
00327	Welwyn International, Inc. Westlake, Ohio
00656	Aerovox Corp. New Bedford, Massachusetts
00686	Film Capacitors Passaic, New Jersey
00779	AMP Inc. Harrisberg, Pennsylvania
01121	Allen-Bradley Co. Milwaukee, Wisconsin
01281	TRW Semiconductors Lawndale, California
01295	Texas Instruments, Inc. Semiconductor Components Div. Dallas, Texas
01686	RCL Electronics Inc. Manchester, New Hampshire
01730	Deleted
01884	Dearborn Electronics Inc. Orlando, Florida
02114	Ferroxcube Corp. Saugerties, New York
02606	Replaced by 15801
02660	Amphenol-Borg Elect. Corp. Broadview, Illinois
02799	Arco Capacitors, Inc. Torrence, California
03508	General Electric Co. Semiconductor Products Syracuse, New York
03614	Replaced by 71400
03651	Replaced by 44655
03797	Eldema Corp. Compton, California
03877	Transitron Electronic Corp. Wakefield, Massachusetts
03888	Pyrofilm Resistor Co., Inc. Cedar Knolls, New Jersey
03911	Clairex Corp. New York, New York
03980	Muirhead Instruments, Inc. Mountainside, New Jersey
04009	Arrow Hart and Hegemen Electronic Company Hartford, Connecticut
04062	Replaced by 72136
04202	Replaced by 81312
04217	Essex Wire Corp. Wire & Cable Div. Anaheim, California
04221	Aemco, Div. of Midtex Inc. Mankato, Minnesota
04222	Aerovox Corp. (H-Q) Myrtle Beach, South Carolina
04645	Replaced by 75376
04713	Motorola Semiconductor Products Inc. Phoenix, Arizona
05082	Replaced by 94154
05236	Jonathan Mfg. Co. Fullerton, California
05277	Westinghouse Electric Corp. Semiconductor Dept. Youngwood, Pennsylvania
05278	Replaced by 43543
05397	Union Carbide Corp. Electronics Div. Cleveland, Ohio
05279	Southwest Machine & Plastic Co. Los Angeles, California
05397	Union Carbide Corp. Electronics Div. New York, New York
05571	Sprague Electric Co. Pacific Div. Los Angeles, California
05574	Viking Industries Chaisworth, California
05704	Alac, Inc. Glendale, California
05820	Wakefield Engineering Ind. Wakefield, Massachusetts
06001	General Electric Company Capacitor Department Irmo, South Carolina
06136	Replaced by 63743
06473	Amphenol Space & Missile Sys. Chatsworth, California
06555	Beede Electrical Instrument Co. Penacook, New Hampshire
06739	Electron Corp. Littletown, Colorado
06743	Clevite Corp. Cleveland, Ohio
06751	Semcor Div., Components, Inc. Phoenix, Arizona
06860	Gould National Batteries Inc. City of Industry, California
06980	Varian-Eimac San Carlos, California
07115	Replaced by 14674
07138	Westinghouse Electric Corp., Electronic Tube Division Elmira, New York
07256	Silicon Transistor Corp. Garden City, New York
07263	Fairchild Semiconductor Div. of Fairchild Camera & Instrument Corp. Mountain View, California
07344	Bircher Co., Inc. Rochester, New York
07792	Lerma Engineering Corp. Northampton, Massachusetts
07910	Teledyne Corp. (Continental Device) Hawthorne, California
08225	Industro Transistor Corp. Long Island City, New York
08530	Reliance Mica Corp. Brooklyn, New York
08792	Discontinued
08806	General Electric Co. Miniature Lamp Dept. Cleveland, Ohio
08863	Nylomatic Corp. Norrisville, Pennsylvania
08988	Skottie Electronics Inc. Archbald, Pennsylvania
09353	C and K Components Watertown, Massachusetts
09423	Scientific Components, Inc. Santa Barbara, California
09922	Burndy Corp. Norwalk, Connecticut
11236	CTS of Berne Berne, Indiana
11237	Chicago Telephone of Calif., Inc. (CTC) Paso Robles, California
11358	Discontinued
11403	Best Products Co. Chicago, Illinois

11503 Keystone Mfg.
Div. of Avis Industrial Corp.
Warren, Michigan

11726 Qualidyne Corp.
Santa Clara, California

12014 Chicago Rivet & Machine Co.
Bellwood, Illinois

12040 National Semiconductor Corp.
Danburry, Connecticut

12060 Diodes, Inc.
Chatsworth, California

12136 Philadelphia Handle Co.
Camden, New Jersey

12323 Presin Co., Inc.
Shelton, Connecticut

12327 Freeway Washer & Stamping Co.
Cleveland, Ohio

12400 Replaced by 75042

12617 Hamlin Inc.
Lake Mills, Wisconsin

12697 Clarostat Mfg. Co.
Dover, New Hampshire

12749 James Electronics
Chicago, Illinois

12856 Micrometals
Sierra Madre, California

12954 Dickson Electronics Corp.
Scottsdale, Arizona

12969 Unitrode Corp.
Watertown, Massachusetts

13103 Thermalloy Co.
Dallas, Texas

13511 Amphenol Corp.
Los Gatos, California

13606 Sprague Electric Co.
Transistor Div.
Concord, New Hampshire

13839 Replaced by 23732

14099 Semtech Corp.
Newbury Park, California

14193 California Resistor Corp.
Santa Monica, California

14298 American Components, Inc.
Conshohocken, Pennsylvania

14655 Cornell-Dubilier Electronics
Newark, New Jersey

14674 Discontinued, see 16299

14752 Electro Cube Inc.
San Gabriel, California

14869 Replaced by 96853

15636 Elec-Trol Inc.
Northridge, California

15801 Fenwal Electronics Inc.
Framingham, Massachusetts

15818 Amelco Semiconductor
Div. of Teledyne Inc.
Mountain View, California

15849 USECO, Inc.
Mt. Vernon, New York

15898 International Business
Machines (IBM)
Essex Junction, Vermont

15909 Replaced by 17870

16299 Corning Glass
Raleigh, North Carolina

16332 Replaced by 28478

16473 Cambridge Scientific Ind. Inc.
Cambridge, Maryland

16742 Paramount Plastics
Downey, California

16758 Delco Radio
Div. of General Motors
Kokomo, Indiana

17001 ITT Cannon
Santa Ana, California

17069 Circuit Structures Lab.
Upland, California

17856 Siliconix, Inc.
Sunnyvale, California

17870 Daven-Div of Thomas A. Edison
Ind. – McGraw - Edison Co.
Manchester, New Hampshire

18083 Deleted

18178 Vactec Inc.
Maryland Heights, Missouri

18612 Vishay Intertechnology
Inc.
Malvern, Pennsylvania

18736 Voltronics Corp.
Hanover, New Jersey

19429 Discontinued, use 89536

19451 Perine Machinery & Supply Co.
Seattle, Washington

19701 Electra Mfg. Co.
Independence, Kansas

20584 Enochs Mfg. Co.
Indianapolis, Indiana

20891 Self-Organizing Systems,
Inc.
Dallas, Texas

22767 ITT Semiconductors
Div. of ITT
Palo Alto, California

23050 Product Comp. Corp.
Mount Vernon, New York

23732 Tracor
Rockville, Maryland

23880 Stanford Applied Engrng.
Santa Clara, California

23936 Pamotor Div., Wm. J. Purdy Co.
Burlingame, California

24248 Southco
Div. of South Chester Corp.
Lester, Pennsylvania

24655 General Radio Co.
West Concord, Massachusetts

24759 Lenox-Fugle Electronics
Plainfield, New Jersey

25403 Amperex Electronic Corp.
Semiconductor & Receiving
Tube Division
Slatersville, Rhode Island

27014 National
Semiconductor
Corp.
Santa Clara, California

27264 Molex Products
Downers Grove, Illinois

28425 Bohannon Industries
Fort Worth, Texas

28478 Deltrol Controls,
Corp.
Milwaukee, Wisconsin

28480 Hewlett Packard
Co.
Palo Alto, California

28520 Heyman Mfg. Co.
Kenilworth, New Jersey

29083 Monsanto, Co., Inc.
Santa Clara, California

30323 Illinois Tool
Works, Inc.
Chicago, Illinois

32539 Mura Corp.
Great Neck, New York

32767 Griffith Plastic
Products Co.
Burlingame, California

32879 Advanced Mechanical
Components
Northridge, California

32897 Erie Technological
Products, Incorporated
Frequency Control Div.
Carlisle, Pennsylvania

33173 General Electric
Co., Tube Dept.
Owensboro, Kentucky

34333 Silicon General
Westminister, California

34335 Advanced Micro
Devices.
Sunnyvale, California

37942 Mallory, P. R. & Co., Inc.
Indianapolis, Indiana

42498 National Company
Melrose, Massachusetts

43543 Nytronics Inc.
Transformer Co. Div.
Alpha, New Jersey

44655 Ohmite Mfg. Co.
Skokie, Illinois

49671 Radio Corp. of America
New York, New York

49956 Raytheon Company
Lexington, Maine

53021 Sanamo Electric Co.
Springfield, Illinois

55026 Simpson Electric Company
Chicago, Illinois

56289 Sprague Electric Co.
North Adam s, Massachusetts

58474 Superior Electric Co.
Bristol, Connecticut

60399 Torrington Mfg. Co.
Torrington, Connecticut

62460 Deleted

63743 Ward Leonard Electric Co.
Mount Vernon, New York

64834 West Mfg. Co.
San Francisco, California

65092 Weston Instruments Inc.
Newark, New Jersey

66150 Winslow Tele-Tronics Inc.
Asbury Park, New Jersey

70563 Amperite Company
Union City, New Jersey

70903 Belden Mfg. Co.
Chicago, Illinois

71002 Birnbach Radio Co., Inc.
New York, New York

71236 "ELMENCO"
Willimantic, Connecticut

71400 Bussmann Mfg.
Div. of McGraw - Edison Co.
Saint Louis, Missouri

71450 CTS Corp.
Elkhart, Indiana

71468 ITT Cannon Electric Inc.
Los Angeles, California

71482 Clare, C. P. & Co.
Chicago, Illinois

71590 Centralab
Div. of Globe Union Inc.
Milwaukee, Wisconsin

71707 Coto Coil Co., Inc.
Providence, Rhode Island

71744 Chicago Miniature Lamp Works
Chicago, Illinois

71785 Cinch Mfg. Co. & Howard
B. Jones Div.
Chicago, Illinois

72005 Driver, Wilber B., Co.
Newark, New Jersey

72092 Replaced by 06980

72136 Electro Motive Mfg. Co.
Willimantic, Connecticut

72259 Nytronics Inc.
Berkeley Heights, New Jersey

72354 Deleted

72619 Dialight Corp.
Brooklyn, New York

72653 G. C. Electronics
Rockford, Illinois

72665 Replaced by 90303

72794 Dzus Fastener Co., Inc.
West Islip, New York

72928 Gudeman Co. (Gulton
Industries)
Chicago, Illinois

72982 Erie Tech. Products Inc.
Erie, Pennsylvania

73138 Beckman Instruments Inc.
Helipot Division
Fullerton, California

73293 Hughes Aircraft Co.
Electron Dynamics Div.
Torrence, California

73445 Amperex Electronic Corp.
Hicksville, New York

73559 Carling Electric Inc.
Hartford, Connecticut

73586 Circle F Industries
Trenton, New Jersey

73734 Federal Screw Products, Inc.
Chicago, Illinois

73743	Fischer Special Mfg. Co. Cincinnati, Ohio
73899	JFD Electronics Co. Brooklyn, New York
73949	Guardian Electric Mfg. Co Chicago, Illinois
74199	Quam Nichols Co. Chicago, Illinois
74217	Radio Switch Corp. Marlboro, New Jersey
74276	Signalite Inc. Neptune, New Jersey
74306	Piezo Crystal Co. Carlisle, Pennsylvania
74542	Hoyt Elect. Instr. Works Penacook, New Hampshire
74970	Johnson, E. F., Co. Waseca, Minnesota
75042	IRC Inc. (Div. of TRW) Philadelphia, Pennsylvania
75376	Kurz-Kasch, Inc. Dayton, Ohio
75382	Kulka Electric Corp. Mount Vernon, New York
75915	Littlefuse Inc. Des Plaines, Illinois
76854	Oak Mfg. Co. Crystal Lake, Illinois
77342	Potter & Brumfield Div. of Amer. Machine & Foundry Princeton, Indiana
77969	Rubbercraft Corp. of Calif. LTD. Torrance, California
78189	Shakeproof Div. of Illinois Tool Works Elgin, Illinois
78277	Sigma Instruments, Inc. South Braintree, Massachusetts
78488	Stackpole Carbon Co. Saint Marys, Pennsylvania
78553	Tinnerman Products Cleveland, Ohio
79136	Waldes Kohinoor Inc. Long Island City, New York
79497	Western Rubber Company Goshen, Indiana
79963	Zierick Mfg. Corp. New Rochelle, New York
80031	Mepco Div. of Sessions Clock Co. Morristown, New Jersey
80145	API Instruments Co. Chesterland, Ohio
80183	Sprague Products North Adams, Massachusetts
80294	Bourns Inc. Riverside, California
80583	Hammarlund Co., Inc. Mars Hill, North Carolina
80640	Stevens, Arnold Inc. Boston, Massachusetts
81073	Grayhill Inc. La Grange, Illinois
81590	Korry Mfg. Co. Seattle, Washington
81312	Winchester Electronics Div. of Litton Industries Oakville, Connecticut
81439	Therm-O-Disc Inc. Mansfield, Ohio
81483	International Rectifier Corp. Los Angeles, California
81741	Chicago Lock Corp. Chicago, Illinois
82305	Palmer Electronics South Gate, California 90280
82389	Switchcraft Inc. Chicago, Illinois
82415	Price Electric Corp. Frederick, Maryland
82872	Roanwell Corp. New York, New York
82877	Rotron Mfg. Co., Inc. Woodstock, New York
82879	ITT Wire & Cable Div. Pawtucket, Rhode Island
83003	Varo Inc. Garland, Texas
83298	Bendix Corp. Electric Power Division Eatontown, New Jersey
83330	Smith, Herman H., Inc. Brooklyn, New York
83478	Rubbercraft Corp. of America New Haven, Connecticut
83594	Burroughs Corp. Electronic Components Div. Plainfield, New Jersey
83740	Union Carbide Corp. Consumer Products Div. New York, New York
84171	Arco Electronics, Inc. Great Neck, New York
84411	TRW Ogallala, Nebraska
86577	Precision Metal Products Stoneham, Massachusetts
86684	Radio Corp. of America Electronic Components & Devices Harrison, New Jersey
86689	Deleted
87034	Marco-Oak Inc. Anaheim, California
88245	Litton Products Inc. Van Nuys, California
88419	Use 14655
88690	Replaced by 04217
89536	Fluke, John Mfg. Co., Inc. Seattle, Washington
89730	Replaced by 08806
90201	Mallory Capacitor Co. Indianapolis, Indiana
90215	Best Stamp & Mfg. Co Kansas City, Missouri
90211	Square D Co. Chicago, Illinois
90303	Mallory Battery Co. Tarrytown, New York
91293	Johanson Mfg. Co. Boonton, New Jersey
91407	Replaced by 58474
91502	Associated Machine Santa Clara, California
91506	Augat Attleboro, Mass.
91637	Dale Electronics Inc. Columbus, Nebraska
91662	Elco Corp. Willow Grove, Pennsylvania
91737	Gremar Mfg Co., Inc. (ITT) Woburn, Massachusetts
91802	Industrial Devices, Inc. Edgewater, New Jersey
91836	King's Electronics Tuckahoe, New York
91929	Honeywell Inc. Micro Switch Div. Freeport, Illinois
91934	Miller Electric Co., Inc. Pawtucket, Rhode Island
93332	Sylvania Electric Products Semiconductor Products Div Woburn, Massachusetts
94145	Replaced by 49956
94154	Tung-Sol Div. of Wagner Electric Corp. Newark, New Jersey
95146	Alco Electronics Products Inc. Lawrence, Massachusetts
95263	Leecraft Mfg. Co. Long Island City, New York
95264	Replaced by 98278
95275	Vitramon Inc. Bridgeport, Connecticut
95303	Radio Corp. of America Solid State & Receiving Tube Div. Cincinnati, Ohio
95354	Methode Mfg. Corp. Rolling Meadows, Illinois
95712	Dage Electric Co., Inc. Franklin, Indiana
95987	Weckesser Co., Inc. Chicago, Illinois
96733	San Fernando Electric Mfg. Co. San Fernando, California
96853	Rustrak Instrument Co. Manchester, New Hampshire
96881	Thomson Industries, Inc. Manhasset, New York
97540	Master Mobile Mounts Div. of Whitehall Electronics Corp. Los Angeles, California
97913	Industrial Electronic Hdware Corp. New York, New York
97945	White, S. S. Co. Plastics Div. New York, New York
97966	Replaced by 11358
98094	Replaced by 49956
98159	Rubber-Teck, Inc. Gardena, California
98278	Microdot Inc. Pasadena, California
98291	Sealectro Corp. Conhex Div. Mamaroneck, New York
98388	Accurate Rubber & Plastics Culver City, California
98743	Replaced by 12749
98925	Deleted
99120	Plastic Capacitors, Inc. Chicago, Illinois
99217	Southern Electronics Corp. Burbank, California
99392	STM Oakland, California
99515	Marshall Industries Capacitor Div. Monrovia, California
99779	Barnes Corp. Lansdowne, Pennsylvania
	Toyo Electronics (R-Ohm Corp.) Irvine, California 92664
	National Connector Minneapolis, Minn. 55436

Appendix B

List of Abbreviations

alternating current	ac	megahertz	MHz
ampere	A	megohm	MΩ
assembly	assy	meter	m
binary coded decimal	bcd	micro (10^{-6})	μ
bel	B	microsecond	μs
capacitor	cap	milli (10^{-3})	m
centimeter	cm	milliamperes	mA
ceramic	cer	millimeter	mm
clockwise	cw	millisecond	ms
common-mode rejection ratio	cmrr	millivolt	mV
composition	comp	minimum	min
counterclockwise	ccw	nano (10^{-9})	n
decibel	dB	nanosecond	ns
degree Celsius	°C	negative	neg
degree Fahrenheit	°F	ohm	Ω
digital voltmeter	dvm	oscilloscope	scope
direct current	dc	parts per million	ppm
electrolytic	elect	peak-to-peak	p-p
external	ext	pico (10^{-12})	p
farad	F	picofarad	pF
field effect transistor	FET	plus or minus	±
germanium	Ge	positive	pos
giga (10^{9})	G	plastic	plstc
gigahertz	GHz	printed circuit board	pcb
ground	gnd	radio frequency	rf
guard	gd	root mean square	rms
henry	H	second (time)	s
hertz	Hz	serial number	SN
high frequency	hg	silicon	Si
hour	h	tantalum	Ta
inch	in	temperature coefficient	TC
integrated circuit	IC	tera (10^{12})	T
intermediate frequency	if	transformer	xfmr
internal	intl	transistor	xstr
kilo (10^{3})	k	ultra high frequency	uhf
kilohertz	kHz	variable	var
kilohm	kΩ	very high frequency	vhf
kilovolt	kV	very low frequency	vlf
low frequency	lf	volt	V
maximum	max	voltage controlled oscillator	vco
mega (10^{6})	M	watt	W
		wirewound	ww

Appendix C

Sales Representatives

ALABAMA
HUNTSVILLE
BCS Associates, Inc.
3322 S. Memorial Parkway
P.O. Box 1273
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SEATTLE
Showalter-Judd, Inc.
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ARIZONA
PHEONIX
Barnhill Associates
7319 E. Stetson Dr.
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Scottsdale, AZ 85251

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Zip 95050

SAN DIEGO
Instrument Specialists, Inc.
4805 Mercury St., Ste. 1
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Zip 92111

COLORADO
DENVER
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Zip 80226

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HARTFORD
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Glastonbury, CT 06033
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(305) 843-1510
Zip 32803

GEORGIA
DECATUR
BCS Associates, Inc.
2522 Tanglewood Road
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646 Queen Street
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INDIANAPOLIS
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Port O'Call Executive Ctr.
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Zip 46244

KENTUCKY
VALLEY STATION
BCS Associates, Inc.
4506 Freda Way
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Electronic Marketing Assoc. Inc.
11501 Huff Court
Kensington, MD 20795
Tel. (301) 881-5300, 744-7700

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BOSTON
Instrument Representatives, Inc.
109 Massachusetts Ave.
Lexington, MA 02173
Tel. (617) 861-8620

MICHIGAN
DETROIT
WKM Associates, Inc.
1474 East Outer Dr.
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Zip 48234

MINNESOTA
MINNEAPOLIS
Cozzens & Cudahy, Inc.
10800 Lyndale Ave. S.
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Zip 55420

MISSOURI
ST. LOUIS
Cozzens & Cudahy Inc.
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NEWARK
SBM Representatives
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Union, NJ 07083
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Pleasantville, NY 10570
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Zip 14622

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Zip 27408

OHIO
CLEVELAND
WKM Associates, Inc.
16141 Puritas Ave.
Tel. (216) 267-0445
Zip 44135

DAYTON
WKM Associates, Inc.
6073 Far Hills Ave.
Tel. (513) 434-7500
Zip 45459

OREGON
BEAVERTON
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13485 S.W. Hargis Road
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Zip 97005

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PHILADELPHIA
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Richardson, TX 75080
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VIRGINIA
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Zip 98108

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640 - 11th Ave. S.W.
Tel. (403) 261-0780

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6427 Northam Drive
Tel. (416) 678-1500

OTTAWA, 3
Allan Crawford Associates, Ltd.
1299 Richmond Road
Tel. (613) 829-9651

QUEBEC

LONGUEUIL
Allan Crawford Associates, Ltd.
1330 Marie Victorian Blvd. East
Tel. (514) 670-1212

INTERNATIONAL REPRESENTATIVES

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Virrey del Pino 4071
Buenos Aires, Argentina

AUSTRALIA
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P.O. Box 334
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AUSTRIA
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1080 Vienna, Austria

BELGIUM
C.N. Rood S.A.
37 Place de Jamblinne de Meux
B-1040 Brussels, Belgium

BRAZIL
Ambriex S.A.
Rue Ceara, 104 - 2°. e 3.° Andares
ZC-29
Rio de Janeiro GB, Brazil

Ambriex S.A.
Rua Tupi, 535
01233 Sao Paulo SP, Brazil

CARIBBEAN
West Indies Sales Co.
606 Calle Aboy
San Juan, Puerto Rico 00907

CHILE
Coasin Chile Ltd.
Casilla 14588 - Correo 15
Santiago, Chile

CHINA, Peoples Republic Of
May Lee Industries, Inc.
31 East 32nd Street
New York, NY 10016

COLOMBIA
Marones Ltd.
Apartado Aereo 90687
Bogota 8, Colombia

CYPRUS
Chris Radiovision Ltd.
P.O. Box 1989
Nicosia, Cyprus

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Teglvaerksgade 37
2100 Copenhagen 0, Denmark

ECUADOR
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Apartado 228A
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Teollisuustie 7
02700 Kauniainen
Finland

FRANCE
M.B. Electroniques S.A.
29, Rue Emile Duclaux
92, Suresnes, France

GERMANY
Fey Elektronische Messgerate
8 Muenchen 19
Horemansstrasse 28
8 Muenchen 19

GREECE
Marios Dalleggio Representations
2 Alopekis Street
Athens 19 Greece

HONG KONG & MACAU
Gilman & Co., Ltd.
P.O. Box 56
Hong Kong

INDIA
Hinditron Services Pvt. Ltd.
69/A.L. Jagmohandas Marg
Bombay - 400006, India

INDONESIA
P.T. United Dico - Citas Co., Ltd.
JLN Penjaringan 39A
Jakara, Indonesia

IRAN
Berkeh Company Ltd.
20 Salm Road, Roosevelt Ave.
Tehran, Iran

ISREAL
R.D.T. Electronics Engineering Ltd.
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Tel Aviv 61210, Isreal

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Tokyo 100-31, Japan

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2-38 Junkeicho-dori
Minami-ku, Osaka

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Seoul, Korea

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P.O. Box 1197
Kota Kinabalu, Sabah
East Malaysia

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Petaling Jaya, Selangor
West Malaysia

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Eugenia 408
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Mexico 12, D.F.
Mexico

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Ri Jswijk (Z.H.) 2100
Netherlands

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Ledeboerstraat 27
Industrieterrein Noord
Tilburg, Netherlands

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Mr. John Groombridge
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LOWER HUTT
New Zealand

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Lagos, Nigeria

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Oslo 5, Norway

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Pak International Operations
505 Muhammadi House-McLeod Rd.
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Electronicas S.A.
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Lima 1, Peru

PORTUGAL
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Lisbon, Portugal

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Republic of South Africa

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Madrid 16, Spain

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Bernerstrasse Sud 169
8048 Zurich, Switzerland

TAIWAN-REPUBLIC OF CHINA
Heighten Trading Company, Ltd.
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Taipei, Taiwan 104

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Codevintec Pacific Inc.
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Caracas 105
Venezuela

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P.O. BOX 5053
TILBURG, THE NETHERLANDS

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FLUKE INTERNATIONAL CORP.
GARNETT CLOSE
WATFORD, WD24TT
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PART NO. 347906
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MFG. CO., INC. P.O. BOX 7428 SEATTLE, WASH. 98133
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V-Ω
2A FUSE
2V MAX
1200V MAX
1200V MAX
COMMON
+1.999
FUNCTION
ACV
AC MA
DCV
DC MA
KΩ
20MΩ
RANGE
2
20
200
POWER
ON-OFF

WARRANTY

Fluke guarantees that any model of the 8000A will meet the specifications published herein throughout one full year from the date you receive it. Further, any part which fails during that time will be replaced and the instrument recalibrated without charge.

FLUKE TECHNICAL SERVICE CENTERS

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Don Walker, Supervisor
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WARRANTY VALIDATION FORM
FLUKE DIGITAL MULTIMETER

To assure validation of your warranty, please provide the following information:

Model 8000A Serial No. ______________ Purchase Date ________________

NOTE

What influenced you to buy the 8000A?

☐ *Advertising and Literature* ☐ *Contact by Local Salesman* ☐ *Other*

Name: ______________________________ Street Address: ______________________________

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Your Company's Product or Service: ________ State: ______________ Zip: ______________

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FLUKE

CERTIFICATE of CALIBRATION

MODEL 8000A

The John Fluke Mfg. Co., Inc. does hereby certify the above listed instrument meets or exceeds all published specifications and has been calibrated using standards whose accuracies are traceable to the National Bureau of Standards within the limitations of the Bureau's calibration services, or have been derived from accepted values of natural physical constants, or have been derived by the ratio type of self-calibration techniques.

Applicable NBS Test Reports:

DC Voltage – 207627

AC Voltage – 807675

Resistance – 207693

William V. Fetrow

STANDARDS ENGINEER

Thomas B. Smith

MANAGER QUALITY ASSURANCE

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FLUKE

FLUKE TECHNICAL SERVICE CENTERS

Fluke Midwestern Technical Center

Fluke Mideastern Technical Center
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Court
Tel 301-881-5300
TWX: 710-825-9645

CERTIFICATE of CALIBRATION

A1008

The John Fluke Mfg. Co., Inc. does hereby certify the above listed instrument meets or exceeds all published specifications and has been calibrated using standards whose accuracies are traceable to the National Bureau of Standards within the limitations of the Bureau's calibration services, or have been derived from accepted values of natural physical constants, or have been derived by the ratio type of self calibration techniques.

STANDARDS ENGINEER

MANAGER QUALITY ASSURANCE

Applicable NBS Test Reports:
DC Voltage — 207627
AC Voltage — 807675

CHANGE/ERRATA INFORMATION

MANUAL — TITLE: 8000A DIGITAL MULTIMETER

MANUAL — ISSUE: JANUARY 1974

Please make changes in this manual according to the following change and/or errata information:

CHANGE #1

Add the following components to the parts list for instruments with serial number 75000 and on:

/CR25/Diode, Si./348177/03508/DA2429/1/
/R62/Res, comp, 22MΩ ± 5%, ¼w/221986/01121/CB2265/1/

Add the following information about the 8000A–05 and 8000A–015 options:

Introduction and Specifications

Current measurement capabilities to 20 amperes are provided in the 8000A–05 (line power) and 8000A–015 (battery power). A separate high current input allows measurements up to 10 amperes, continuously, and from 10 to 20 amperes for periods of one minute or less. The 8000A–05/–015 specifications are identical to the 8000A and 8000A–01 except for the extended current range. Specifications for the extended current range are listed below.

Fluke Western Technical Center

CHANGE/ERRATA INFORMATION

MANUAL — TITLE: 8000A DIGITAL MULTIMETER

ISSUE: JANUARY 1974

Please make changes in this manual according to the following change and/or errata information:

CHANGE #1

Add the following components to the parts list for instruments with serial number 75000 and on:

/CR25/Diode, Si./348177/03508/DA2429/1/
/R62/Res, comp, 22MΩ ± 5%, ¼w/221986/01121/CB2265/1/

Add the following information about the 8000A–05 and 8000A–015 options:

Introduction and Specifications

Current measurement capabilities to 20 amperes are provided in the 8000A–05 (line power) and 8000A–015 (battery power). A separate high current input allows measurements up to 10 amperes, continuously, and from 10 to 20 amperes for periods of one minute or less. The 8000A–05/–015 specifications are identical to the 8000A and 8000A–01 except for the extended current range. Specifications for the extended current range are listed below.

DC CURRENT 10A RANGE

Ranges:	± 10.00A (1 min. operation from 10A to 20A)
Accuracy: (1 Year, 15°C to 35°C)	±(0.5% of reading +1 digit) –– 10 Amp range
Voltage Burden:	0.5V maximum up to 10 Amps
Response Time:	½ second
Maximum Input:	20 Amps (Not fused)
Operating Time:	10 Amp and below continuous Above 10 Amps 1 minute Max (Duty cycle 25%)

AC CURRENT 10A RANGE

Ranges:	10.00A (1 min. operation from 10A to 20A)
Accuracy: (1 Year, 15°C to 35°C)	45 Hz to 3 kHz ± (1% of reading +2 digits)
Voltage Burden:	0.5V maximum up to 10 Amps
Response Time:	3 seconds, worst case
Maximum Input:	20 Amps (Not fused)
Operating Time:	10 Amps and below continuous Above 10 Amps 1 minute max. (Duty cycle 25%)

Operating Instructions

The following table lists the proper input connections and pushbuttons for measuring high currents to 20 amperes.

MEASUREMENT	FUNCTION	RANGE	INPUT CONNECTION	MAXIMUM INPUT	OPERATING TIME
DC Amperes	DC MA	20	10A Input	20A	Continuous to 10A. Above 10A, 1 min. or less (25% Duty Cycle)
AC Amperes	AC MA	20	10A Input	20A	

CHANGE #2

Delete information about the 80K-30 High Voltage Probe on pages 6-5 and 6-6. The probe is being replaced by the 80K-40 High Voltage Probe which has capabilities to 40 kilovolts. This probe is described below.

Add the following information about the new option and accessories for the 8000A:

LOW OHMS DMM, 8000A–06

Introduction and Specifications

Another option has been added to the 8000A which provides two additional resistance ranges of 2 ohms and 20 ohms and a means of cancelling lead resistance in these two ranges. This option is designated the 8000A–06. Specifications for the 8000A–06 are identical to the 8000A with the following exceptions.

RESISTANCE

Ranges:	1.999Ω, 19.99Ω, 199.9Ω, 1.999 kΩ, 19.99 kΩ, 199.9 kΩ, 1999 kΩ (Note: the 19.99 MΩ range has been removed to provide 2Ω and 20Ω function selection.)
Accuracy: (1 Year, 15°C to 35°C)	± (0.2% of reading +1 digit) all ranges except: ± (0.5% of reading +2 Digits) on 20Ω range and ± (1% of reading +2 digits) on 2Ω range, 2Ω & 20Ω accuracy assumes lead resistance zeroed with front panel control
Response Time:	½ second, all ranges
Current Through Unknown:	2Ω range, 10 mA - 20Ω range, 10 mA
Maximum Input Voltage:	2Ω through 2 KΩ ranges 130V rms (Note: Separate input for 2Ω and 20Ω ranges) 20 KΩ through 2000K ranges 250V rms.
Temperature Coefficient: (2Ω and 20Ω)	± 0.03/°C of input (assumes lead resistance zeroed with front panel control)

GENERAL

Max. Common Mode Voltage:	500V peak

Operation

The only difference in operation between the 8000A and 8000A–06 is the low ohms ranges. Operation of these ranges is described below.

a. Connect test leads to LO Ω and COMMON terminals.

NOTE!

The test leads supplied with the 8000A–06 should be used for measurements within these ranges. Any leads used as substitutes should have a resistance from 60 to 140 milliohms (lead resistance for a five foot pair of #20 wire is 100 milliohms).

b. Select LO Ω FUNCTION

c. Select desired range by pulling NULL control out for 2Ω range and pushing NULL control in for 20Ω range.

d. Touch test lead tips together and adjust NULL control until all zeros appear on front panel display.

NOTE!

Readjust NULL control after each range change.

e. Connect test leads across unknown resistance and read value in ohms directly on front panel display.

RF PROBE (81RF)

Ranges:	± 10.00A (1 min. operation from 10A to 20A)
Accuracy: (1 Year, 15°C to 35°C)	±(0.5% of reading +1 digit) — 10 Amp range
Voltage Burden:	0.5V maximum up to 10 Amps
Response Time:	½ second
Maximum Input:	20 Amps (Not fused)
Operating Time:	10 Amp and below continuous Above 10 Amps 1 minute Max (Duty cycle 25%)

AC CURRENT 10A RANGE

Ranges:	10.00A (1 min. operation from 10A to 20A)
Accuracy: (1 Year, 15°C to 35°C)	45 Hz to 3 kHz ± (1% of reading +2 digits)
Voltage Burden:	0.5V maximum up to 10 Amps
Response Time:	3 seconds, worst case
Maximum Input:	20 Amps (Not fused)
Operating Time:	10 Amps and below continuous Above 10 Amps 1 minute max. (Duty cycle 25%)

Operation

The only difference in operation between the 8000A and 8000A–06 is the low ohms ranges. Operation of these ranges is described below.

a. Connect test leads to LO Ω and COMMON terminals.

NOTE!

The test leads supplied with the 8000A–06 should be used for measurements within these ranges. Any leads used as substitutes should have a resistance from 60 to 140 milliohms (lead resistance for a five foot pair of #20 wire is 100 milliohms).

b. Select LO Ω FUNCTION

c. Select desired range by pulling NULL control out for 2Ω range and pushing NULL control in for 20Ω range.

d. Touch test lead tips together and adjust NULL control until all zeros appear on front panel display.

NOTE!

Readjust NULL control after each range change.

e. Connect test leads across unknown resistance and read value in ohms directly on front panel display.

RF PROBE (81RF)

Introduction and Specifications

The Model 81RF High Frequency Probe has accurate measurement capabilities from 100 kHz to 100 MHz. It may be used for relative measurements from 20 kHz to 100 kHz and from 100 MHz to 250 MHz. The peak responding probe is calibrated to provide a positive dc output equal to the rms value of a sine wave input. Specifications for the probe are as follows:

Transfer Accuracy:	± 1 dB from 100 kHz to 100 MHz
Voltage Range:	.25V rms to 30V rms (operated into a 10 MΩ input resistance voltmeter). Peak responding calibrated to read rms value of a sine wave.
Maximum DC Input:	350V
Input Impedance:	12 MΩ shunted by ≈15 pf maximum

Operation

a. Connect 81RF between the V–Ω and COMMON terminals.

b. Select the DCV FUNCTION and the 2, 20 or 200 RANGE.

c. The rms value of the sine wave input is displayed directly on the front panel readout as a +dc voltage.

HIGH VOLTAGE PROBE (80K40)

Introduction and Specification

The Model 80K40 High Voltage Probe extends the voltage measuring capabilities of the 8000A to 40 kV. Specifications for the probe are listed below:

Overall Accuracy:	20 kV to 30 kV ± 2% (Calibrated 1% at 25 kV)
Upper Limit:	Changes linear from 2% at 30 kV to 4% at 40 kV.
Lower Limit:	Changes linear from 2% at 20 kV to 4% at 1 kV.
Voltage Range:	1 kV to 40 kV
Input Resistance:	1000 MΩ
Division Ratio:	1000:1

Operation

a. Plug high voltage probe cable assembly into the V–Ω and COMMON INPUT terminals on the 8000A front panel. Insure that keyed side of dual banana plug is connected to COMMON terminal on 8000A.

b. Select DCV FUNCTION pushbutton.

c. Select RANGE pushbutton in accordance with Table 1. (The table accounts for the probe division ratio of 1000:1).

Table 1. HIGH VOLTAGE PROBE

8000A RANGE PUSHBUTTON	8000A DC VOLTAGE RANGE WITH PROBE	8000A READOUT RANGE WITH PROBE (Kilovolts)
200	20 kV to 40 kV	20.0 to 40.0
20	2 kV to 20 kV	2.00 to 19.99
2	1 kV to 2 kV	1.000 to 1.999

d. With common lead connected to suitable ground, connect probe to point to be measured. Observe readout on 8000A DMM in kilovolts.

CAUTION!

Always connect common lead to ground before touching high voltage probe to high voltage source and never remove the ground wire during a measurement. Failure to do so may result in damage to instrument.

CARRYING CASE (C86)

The Model C86 is a molded polyethylene carrying case with handle for the 8000A. This rugged case provides protection against rough transit handling and different weather conditions. Additional storage space is provided for test leads, power cord, and other compact accessories.

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(continued on page ii)

Introduction and Specifications

The Model 81RF High Frequency Probe has accurate measurement capabilities from 100 kHz to 100 MHz. It may be used for relative measurements from 20 kHz to 100 kHz and from 100 MHz to 250 MHz. The peak responding probe is calibrated to provide a positive dc output equal to the rms value of a sine wave input. Specifications for the probe are as follows:

Transfer Accuracy:	± 1 dB from 100 kHz to 100 MHz
Voltage Range:	.25V rms to 30V rms (operated into a 10 MΩ input resistance voltmeter). Peak responding calibrated to read rms value of a sine wave.
Maximum DC Input:	350V
Input Impedance:	12 MΩ shunted by ≈15 pf maximum

Operation

a. Connect 81RF between the V–Ω and COMMON terminals.

b. Select the DCV FUNCTION and the 2, 20 or 200 RANGE.

c. The rms value of the sine wave input is displayed directly on the front panel readout as a +dc voltage.

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Section 1

Introduction & Specifications

1-1. DESCRIPTION

1-2. The compact and light weight Model 8000A is a three and one-half digit multimeter. A unique analog-to-digital conversion technique, with inherent self zeroing, eliminates offset uncertainties. Two LSI chips comprise the analog-to-digital converter providing a low discrete component count. Other features include automatic digital determination of polarity, continuous filtering, LED readout, and several options and accessories.

1-3. Pushbutton controls allow the selection of five ac and dc voltage ranges, five ac and dc current ranges, and six resistance ranges. Accurate measurement capabilities are from 100 microvolts to 1200 volts ac and dc, 100 nanoamperes to 1.999 amperes ac and dc, and 100 milliohms to 19.99 megohms.

1-4. OPTIONS

1-5. Four versions of the digital multimeter are available. The basic instrument is line powered and designated the 8000A. A rechargeable battery version of the basic instrument is designated the 8000A–01 option. Another line powered version, 8000A-02 option, is equipped with a Data Printer Output Unit for data aquisition systems or to drive a digital printer. However, Option –01 cannot be combined with Option –02.

These options are summarized in Table 1-1 and must be specified at the time of purchase. Operation, theory of operation, maintenance, and replaceable parts for these versions are described in the following Section 2 through Section 5.

Table 1-1. 8000A OPTIONS.

MODEL NO.	OPTION DESCRIPTION
8000A–01	Mainframe w/battery pack
8000A–02	Mainframe, line powered w/data output

1-6. ACCESSORIES

1-7. Several accessories are available for use with all versions of the 8000A. These accessories are listed in Table 1-2. A description of the individual accessories will be found in Section 6.

Table 1-2. 8000A ACCESSORIES.

MODEL NO.	ACCESSORY DESCRIPTION
C80	Carrying Case w/strap
A80	Universal Test Lead Kit
80K-30	High Voltage Probe (1kV to 30kV)
80RF	RF Probe (100kHz to 600MHz)
80I-600	Clamp-on AC Current Probe (2A to 600A)
M00-100-714	Front Panel Dust Cover
M00-200-612	Rack Mount, Center
M00-200-611	Rack Mount, Offset

1-8. SPECIFICATIONS

DC VOLTAGE

Ranges	±199.9mV, ±1.999V, ±19.99V, ±199.9V, ±1199V
Accuracy:	
1 year, 15°C to 35°C	±(0.1% of reading +1 digit)
Input Impedance	10 Megohms, all ranges
Normal Mode Rejection	Greater than 60db @ 50Hz, 60Hz
Common Mode Rejection (1kΩ unbalance)	Greater than 120db @ dc and 50Hz, 60Hz
Response Time	1/2 second
Maximum Input Voltage	1200V dc or 1200V rms (sinusoidal)

AC VOLTAGE

Ranges	199.9mV, 1.999V, 19.99V, 199.9V, 1199V
Accuracy:	
1 year, 15°C to 35°C	45Hz to 10kHz ±(0.5% +2 digits) 10kHz to 20kHz ±(1% +2 digits)
Input Impedance	10 megohms in parallel with 100pf
Common Mode Rejection (1kΩ unbalance)	Greater than 60db @ 50Hz, 60Hz
Response Time	3 seconds, worst case
Maximum Input Voltage	1200V rms (sinusoidal), not to exceed 10^7 volts · Hz product on 20, 200, 1200V ranges, 500V rms (sinusoidal) on 200mV and 2V ranges.

DC CURRENT

Ranges	±199.9μA, ±1.999mA, ±19.99mA, ±199.9mA, +1999mA

1 year, 15°C to 35°C	±(0.3% of reading +1 digit)
Voltage Burden	0.25V maximum on all ranges except 0.5V on 2000mA range.
Response Time	1/2 second
Maximum Input	2 Amps rms (fuse protected)

AC CURRENT

Ranges	199.9μA, 1.999mA, 19.99mA, 199.9mA, 1999mA
Accuracy:	
1 year, 15°C to 35°C	45Hz to 10kHz ±(1.0% of reading +2 digits) except 2000mA range. 45Hz to 3kHz ±(1.0% of reading +2 digits) on 2000mA
Voltage Burden	0.25V maximum on all ranges except 0.5V on 2000mA range.
Response Time	3 seconds
Maximum Input	2 Amps rms (fuse protected)

RESISTANCE

Ranges	199.9Ω, 1.999kΩ, 19.99kΩ, 199.9kΩ, 1999kΩ, 19.99MΩ
Accuracy:	
1 year, 15°C to 35°C	200Ω, 2kΩ, 20kΩ, 200kΩ, 2000kΩ ranges ±(0.2% of reading +1 digit) 20MΩ range ±(0.5% of reading +1 digit)
Response Time	200Ω, 2kΩ, 20kΩ, 200kΩ, 2000kΩ ranges: 1/2 second 20MΩ range: 4 seconds

Current through Unknown

200Ω Range	1mA
2kΩ Range	1mA
20kΩ Range	100μA
200kΩ Range	1μA
2000kΩ Range	1μA
20MΩ Range	0.1μA

Accuracy:

Maximum Input Voltage	200Ω and 2kΩ Ranges	130V rms
	20kΩ thru 20MΩ Ranges	250V rms

TEMPERATURE COEFFICIENTS (−10°C to 15°C and 35°C to 55°C)

DC V	±(0.01% reading/°C + .005% F.S/ °C)
DC MA	±(0.015% reading/ °C + 0.005% F.S./ °C)
KΩ	±(0.015% reading/ °C + 0.005% F.S./ °C)
10 Meg	±(0.02% reading/ °C + 0.005% F.S./ °C)
AC V	±(0.01% reading/ °C + 0.005% F.S./ °C)
AC MA	±(0.015% reading/ °C + 0.005% F.S./ °C)

DIGITAL PRINTER OUTPUT UNIT, OPTION −02

Data Available	Polarity, Overload, Digits and Overrange Bit
Flag	Busy (modifiable to Ready)
Control Inputs	Continuous Update and Data Update
Output Logic Levels	Logic "1" = 4.3 to 5.7 volts thru 15 kΩ pullup (modifiable to 15 volts maximum) Logic "0" = 0 to 0.4 volts, will sink 6mA
Printer Reference	5 volts thru 15kΩ for reference high
Miscellaneous	TTL compatible and buffered outputs

ENVIRONMENTAL

Operating Temp. Range	−10°C to +55°C
Storage Temp. Range	−40°C to +75°C (−40°C to +60°C with batteries)
Humidity Range	0 to 80% RH
Shock and Vibration	Meets requirements of MIL-T-21200K and MIL-E-16400F

GENERAL

Maximum Common Mode Voltage	1200V peak
Display	7-segment LED, 0.25″ character height
Size	Approx. 8½″ wide x 2½″ high x 10″ deep (see outline drawing, Figure 1-1)
Weight	2¾ lbs. (1,2Kg) without batteries, 4lbs. (1,8Kg) with batteries
Power	100-115-230V ac, 50 to 400Hz, 2 watts
Battery Option (−01)	8-hour or more operation on internal rechargeable batteries.

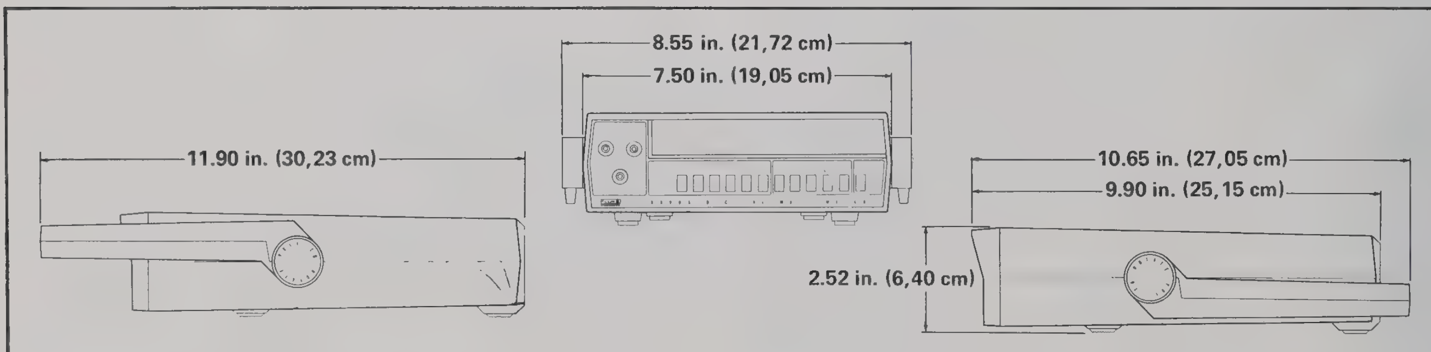


Figure 1-1. MODEL 8000A OUTLINE DRAWING

Section 2

Operating Instructions

2-1. INTRODUCTION

2-2. This section contains information regarding installation and operation of the Model 8000A. The contents of this section should be read before operating the digital multimeter. Operating instructions for accessories are described in the accessories section, Section 6. Should any difficulties be encountered during operation, please contact your nearest John Fluke Sales Representative or the John Fluke Mfg. Co., Inc. P.O. Box 7428, Seattle, Washington, 98133, telephone (206) 774-2211. A list of Sales Representatives is located on the inside of the rear cover.

2-3. INPUT POWER

2-4. The Model 8000A and 8000A–01 are supplied with one of three ac input power configurations. These consist of the Model 8000A/10 (100 volts, 50 to 400Hz), Model 8000A (115 volts, 50 to 400Hz), and Model 8000A/23 (230 volts, 50 to 400Hz). Before connecting to ac line power, insure that the instrument is in the proper configuration for your power requirements. A decal on the underside of the instrument indicates which ac line voltage is required.

2-5. RACK INSTALLATION

2-6. The Model 8000A may be mounted in a standard 19 inch rack when supplied with the appropriate rack mounting kit (refer to Table 1-1). Rack mounting kits are available to allow left, right or center mounting. Instructions for installing units in the rack mount are supplied with the rack mounting kit. These instructions are repeated in Section 6.

2-7. OPERATING FEATURES

2-8. The location and function of all controls, connectors, and indicators are shown in Figure 2-1. Operating features and instructions for accessories are discussed in Section 6.

2-9. OPERATING NOTES

2-10. Fuse

2-12. Battery Power, Option –01

2-11. The MA INPUT terminal is also a fuseholder for the current protection fuse, F2. By twisting the terminal in the direction indicated on the front panel, the fuse can be removed. A replacement fuse is shipped with each instrument. The line fuse, F1, is located near the power transformer. To gain access to this fuse, remove the retaining screw at the rear of instrument case, and remove instrument from case.

CAUTION!

Damage may result if alkaline, zinc-carbon or mercury batteries are charged.

2-13. Power for the Model 8000A–01 is supplied by internal rechargeable batteries that allow the instrument to operate for at least eight hours. Whenever the light quality of the display is too low to read, the batteries should be recharged. Recharging is most rapidly accomplished by switching to OFF and connecting the instrument to the ac power line. In this way, the discharged batteries can be completely charged in approximately 12 to 14 hours. The instrument can also be operated when recharging on ac power, but recharging time will be extended to approximately 43 hours.

NOTE!

Battery manufacturers recommend that nickle-cadmium batteries should not be stored for extended periods of time without recharging at least every 90 days. Storage temperatures below 25°C are recommended.

2-14. Input Connections

2-15. Three INPUT terminals (MA, V–Ω, and COMMON) provide connection to the source or resistance under measurement. For source measurements, the MA or V–Ω and COMMON terminals connect to the respective high and low sides of the source. An unknown resistance is connected between the V–Ω and COMMON terminals.

2-16. Overload Protection ⚠

2-17. An overload condition is indicated by the simultaneous flashing of the display readouts. The dc voltage function can sustain up to 1200 volts dc or 1200 volts rms, sinusoidal, between the V–Ω and COMMON terminals on any range. The ac voltage function can sustain up to 1200 volts rms (not to exceed 10^7 volt·hertz) on the 20, 200 and 1200 volt ranges and 500 volts rms, sinusoidal, on the 200 millivolt and 2 volt ranges between the V–Ω and COMMON terminals. The current input is fuse protected above 2 amperes rms with a maximum of 2 volts rms between the MA and COMMON terminals. Protection for the resistance function is to 130 volts rms between the V–Ω and COMMON terminals in the 200 ohm and 2 kilohm ranges, and 250 volts rms in the 20 kilohm through 20 megohm ranges.

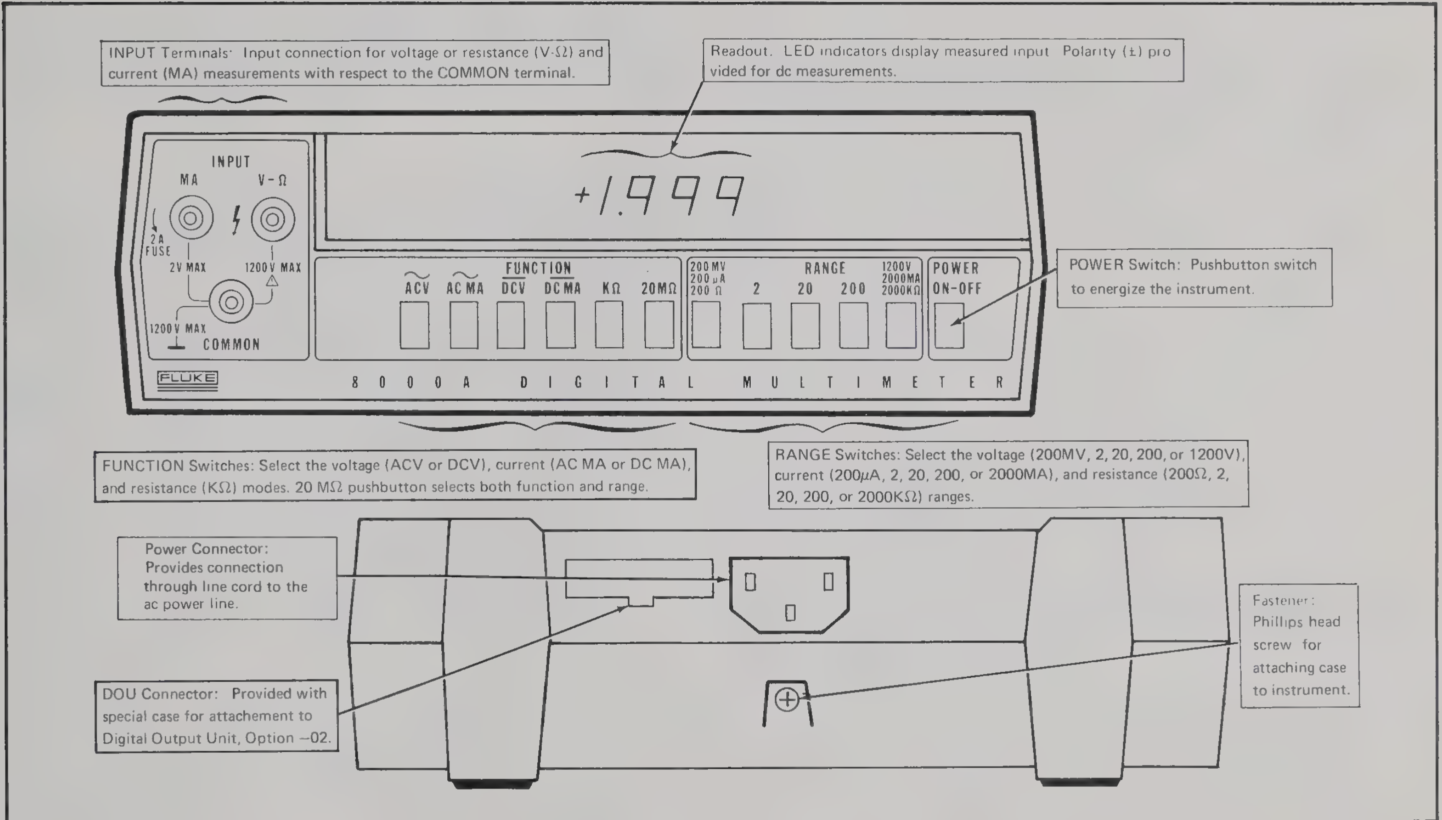


Figure 2-1. OPERATING FEATURES

2-18. BASIC DMM MEASUREMENT

2-19. Table 2-1 lists the proper FUNCTION pushbuttons, RANGE pushbuttons, and INPUT terminal connections for performing specific measurements. These instructions, regarding front panel operation, apply to all Model 8000A's with or without options. Operation of the DMM with range extending accessories are discussed in Section 6 under the particular accessory.

Table 2-1. BASIC MEASUREMENT INSTRUCTIONS

MEASUREMENT	FUNCTION	RANGE	INPUT CONNECTION	MAXIMUM OVERLOAD	REMARKS
DC Volts	DCV	200MV, 2, 20 200, or 1200V	V–Ω and COMMON	1200V dc or 1200V rms (sinusoidal)	Auto-polarity
DC Milliamperes	DC MA	200μA, 2, 20 200 or 2000MA	MA and COMMON	2A (Fuse Protected)	
AC Volts	ACV	200MV, 2, 20 200 or 1200V	V–Ω and COMMON	1200V rms (sinusoidal), not to exceed 10^7 V·Hz on 20, 200, 1200V ranges. 500V rms (sinusoidal) on 200mV and 2V ranges	
AC Milliamperes	AC MA	200μA, 2, 20 200, or 2000MA	MA and COMMON	2A (Fuse Protected)	
Kilohms	KΩ	200Ω, 2, 20 200, or 2000KΩ	V–Ω and COMMON	130V rms, 200Ω and 2kΩ ranges. 250V rms, 20kΩ thru 2000kΩ ranges.	
Megohms	20MΩ	Any	V–Ω and COMMON	250V rms	Range switches non-functional

2-20. DIGITAL PRINTER OUTPUT UNIT, OPTION –02, OPERATION

2-21. Introduction

2-22. The Model 8000A–02 Digital Multimeter provides non-isolated buffered data output for input to data systems or to drive a digital printer. Data output is in parallel BCD format and consists of digits, polarity, overload information, a +5 volt printer reference and busy flag.

2-23. Description

2-24. The DPOU is housed within the Model 8000A–02 case. Output from the DPOU is through a twenty pin connector located at the rear of the instrument case. A mating connector with backshell and strain relief is supplied for fabrication of an interface cable assembly. Paragraph 2-30 gives the procedure for wiring to the mating connector. Pin assignments for output data are given in Table 2-2. Input command assignments are in Table 2-3.

Table 2-2. DPOU OUTPUT DATA

PIN		OUTPUTS	LINES
2		MSD (MOST SIGNIFICANT DIGIT) Logic "1" = decimal 1 Logic "0" = decimal 0	1
10	(8)	2SD	4
11	(4)		
12	(2)		
4	(1)		
19	(8)	3SD	4
3	(4)		
6	(2)		
14	(1)		
18	(8)	LSD (Least Significant Digit)	4
7	(4)		
20	(2)		
9	(1)		
8		Polarity - Logic 1 = "+", "AC", "Ω", Logic 0="–"	1
5		Overload-Logic 1 = overload, Logic 0=no overload	
13		Busy Flag - Logic 1 = busy, Logic 0 = not busy	1
16		Common	1
1		Reference - reference high = +5V through 15kΩ	1

OUTPUT LOGIC	LEVELS
Logic 0	0 to +0.4V
Logic 1	+4.3V to +5.7V

Table 2-3. DPOU INPUT DATA

DATA \ CONTROL	DATA UPDATE	CONTINUOUS UPDATE
Pin Assignments	15	17
Logic "1"	Open or +5V (for reset)	Open or +5V (data hold)
Logic "0"	0V to +0.4V* (negative transition causes update)	0V to +0.4V* (continuous update, 6 times/sec)
Pulse Width	⩾ 10 µsec.	– – – – – – –

*Or contact closure to common.

2-25. The DPOU is triggered internally when commanded by one of two external control lines; Data Update and Continuous Update. Data Update line, pin 15, updates the DPOU each time the command changes from logic 1 to logic 0 (negative transition). Data Update command rates greater than three times per second will cause duplication of data output. Holding the Continuous Update line, pin 17, at logic 0 causes data output to be updated at the internal trigger rate of the DPOU; typically six times per second.

2-26. The updating period is signified by a logic 1 at the Busy Flag, pin 13. External commands during the Busy period will be ignored. Calling the DPOU for data does not affect the digital multimeter measurement cycle. Any input changes to the digital multimeter after the DPOU has been commanded for update will not be reflected in the data output, although present in digital readout. The new data will not be available until the DPOU is commanded again.

2-27. Optional Modification

2-28. Two provisions in the design of the DPOU PCB Assembly gives the user an optional Ready Flag and ability to use an external pull-up voltage to 15 volts maximum. Procedures for changing the Busy Flag to Ready and providing for an external pull-up voltage are described in Section 4.

2-29. DPOU Mating Connector Assembly

2-30. Use the following procedure for installing the connector assembly supplied with the 8000A–02.

2-31. MATERIALS REQUIRED

a. # 26 wire, teflon or vinyl insulated

b. Sleeving, # 16 for vinyl insulated wire or # 18 for teflon insulated wire

c. 60/40 rosin core solder

d. Wire stripper

e. Soldering iron, pencil-type (45W max.)

f. Vise or similar holding device for connecotr

2-32. ASSEMBLY PROCEDURE

a. Slide wire bundle through backshell, see Figure 2-2a.

b. Strip 1/8 inch insulation from wires (20) and tin ends.

c. Cut 20 pieces of sleeving to 3/16 inch lengths.

d. Slide sleeving over prepared wire ends, far enough to prevent interference while soldering.

e. Place connector in holding device and tin lugs.

f. Note numbering sequence in Figure 2-3a.

g. Solder one prepared wire to each lug, refer to Figure 2-3b.

h. Assemble backshell and connector, see Figure 2-2a.

i. Secure wire bundle at rear of backshell with Panduit supplied, see Figure 2-2b, to complete assembly.

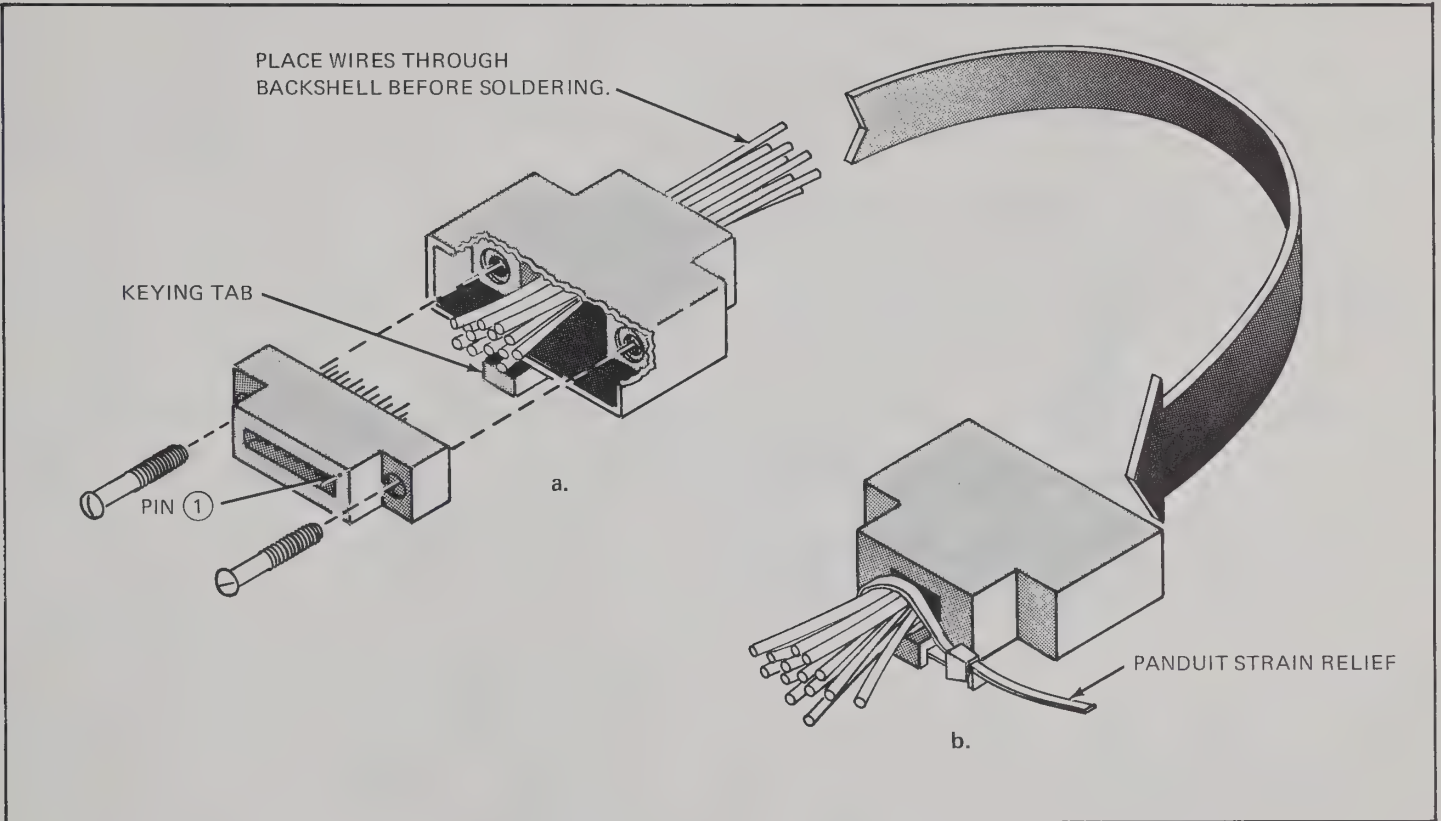


FIGURE 2-2. BACKSHELL ASSEMBLY

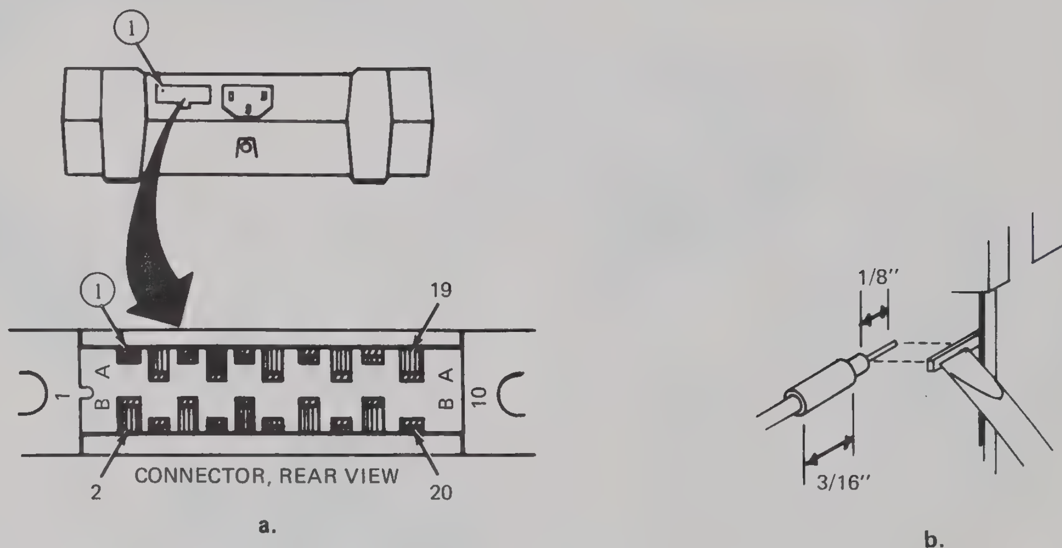


Figure 2-3. CONNECTOR ASSEMBLY.

Section 3
Theory of Operation

3-1. INTRODUCTION

3-2. Information about the Model 8000A theory of operation is arranged under two major headings. One heading is titled BLOCK DIAGRAM ANALYSIS. Discussion at the block diagram level consists of the overall operation of the major circuits within the instrument. The other heading is titled CIRCUIT DESCRIPTIONS. At this level, the discussion consists of component functions within the major circuits. Block diagrams and simplified schematics are included in this section. Schematic diagrams are located at the rear of this manual.

3-3. BLOCK DIAGRAM ANALYSIS

3-4. Introduction

3-5. Note in the block diagram, Figure 3-1, that the toned areas divide the instrument into three major sections. These sections, Signal Conditioning, Analog-to-Digital Converter, and Display, are discussed separately in the following paragraphs. Figure 3-2 illustrates a block diagram of the Digital Printer Output Unit, Option –02, which is also discussed in the following paragraphs.

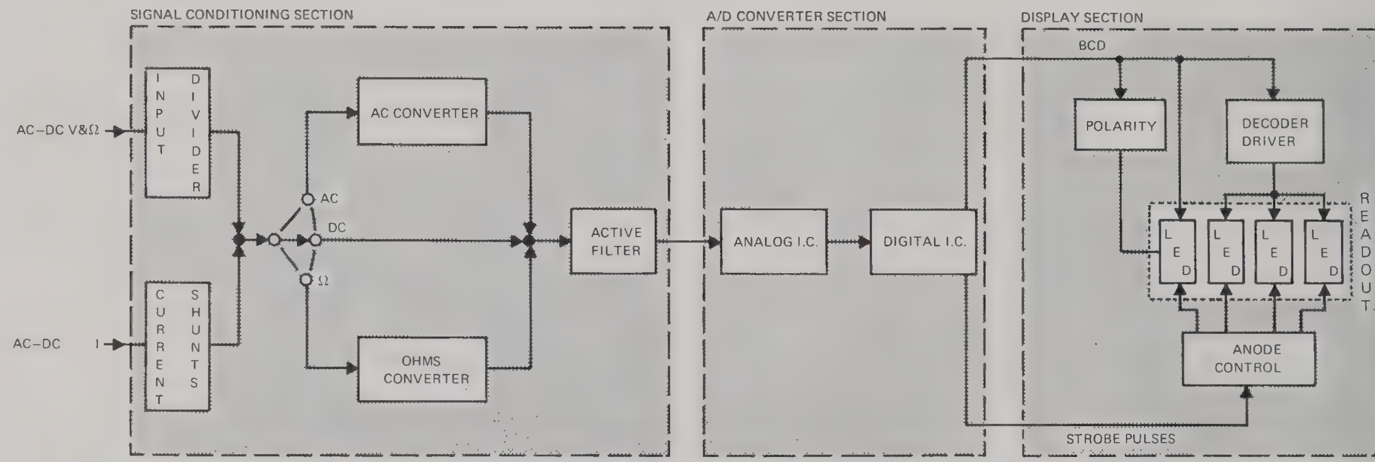


Figure 3-1. MODEL 8000A BLOCK DIAGRAM

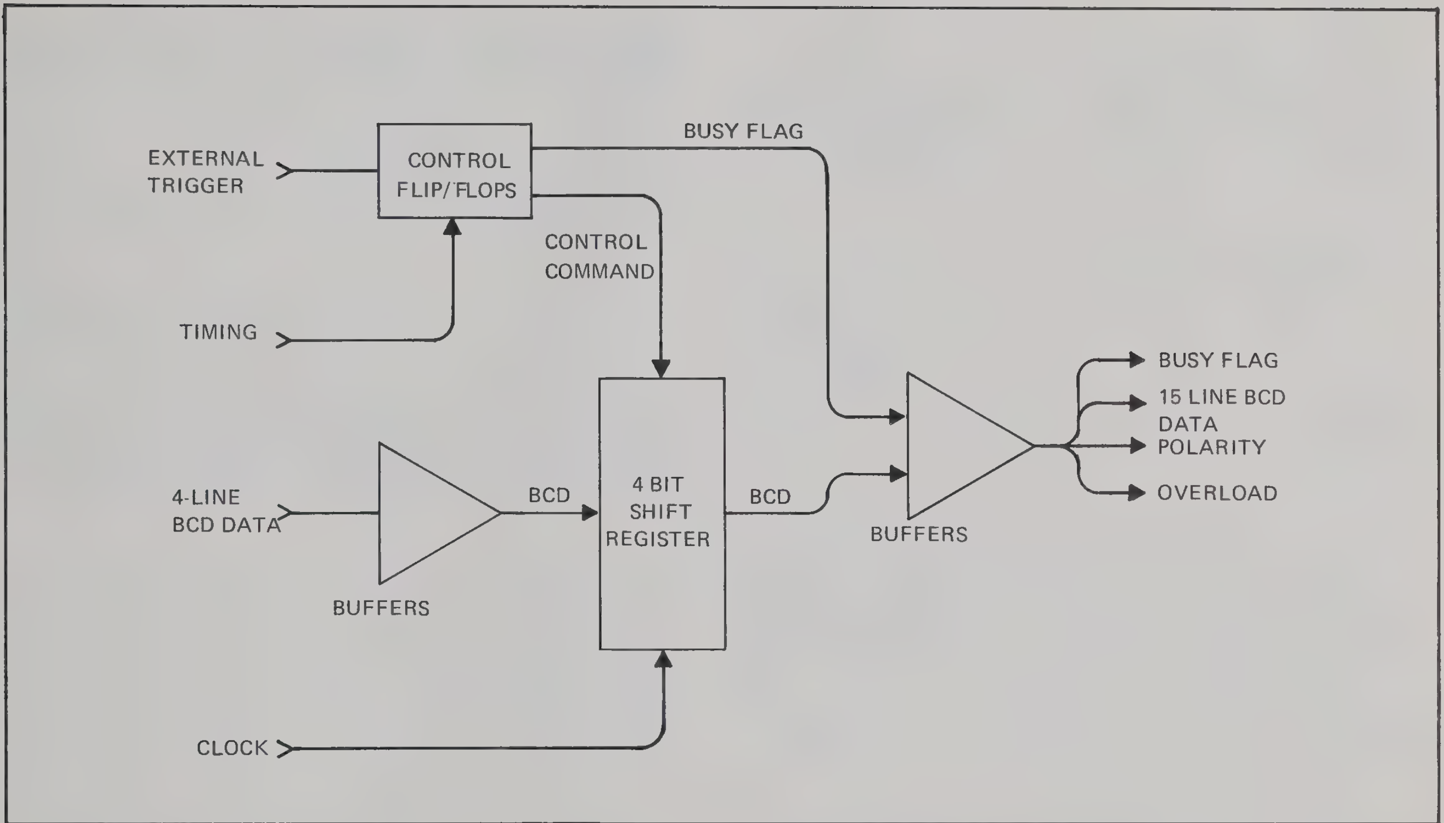


Figure 3-2. DPOU BLOCK DIAGRAM

3-6. Signal Conditioning

3-7. The Signal Conditioning section provides a dc analog voltage, characteristic of the applied input, to the Analog-to-Digital Converter section. This task is accomplished by the Input Voltage Divider, Current Shunts, AC Converter, Active Filter, and associated switching.

3-8. Analog-to-Digital Converter

3-9. The Analog-to-Digital (A/D) Converter section changes the dc output voltage from the Signal Conditioning section to digital information. This is accomplished by a unique A/D conversion technique that eliminates zero error. Two LSI (Large Scale Integration) circuits comprise the A/D Converter. These circuits are the Analog Integrated Circuit and the Digital Integrated Circuit.

3-10. Display

3-11. Digital information from the A/D Converter section is decoded and visually presented by the Display section. The decoded digital information is displayed on numerical LED (Light Emitting Diode) readouts. Decoding of the digital information is accomplished by the Polarity, Decoder Driver, and Anode Control Circuits.

3-12. Digital Printer Output Unit, Option –02

3-13. Serial input data to the Display Section is also applied to the DPOU where it is converted to parallel BCD output. As seen in Figure 3-2, the BCD input is applied through Buffers to a 4-Bit Shift Register. Commands for controlling the register come from the Control Flip-Flops. Timing information from the 8000A and external trigger commands tell the Control Flip-Flops when to load and unload the register.

3-14. CIRCUIT DESCRIPTIONS

3-15. Analog-to-Digital Converter

3-16. GENERAL. The A/D Converter uses a voltage to frequency conversion technique. A dc voltage at the input of the A/D Converter is changed to a frequency by the Analog Integrated Circuit. This frequency is characteristic of the magnitude and polarity of the dc input voltage. Counting of the output frequency from the Analog I.C. is accomplished by the Digital Integrated Circuit. The resultant count is transferred in BCD (Binary Coded Decimal) format to the Dispaly section.

3-17. ANALOG I.C. The frequency output from the Analog I.C. varies $\pm$40kHz from a rest frequency of approximately 80kHz. Input switching circuitry within the Analog I.C. (refer to Figure 3-2) alternately samples between input common and the dc voltage input at a 120 millisecond rate. During the input common sample period the output of the Voltage to Frequency (V/F) Converter is at the rest frequency. The following input voltage sample generates an output frequency above or below the rest frequency for a respective negative or positive input voltage. Therefore, the dc input voltage to the A/D Converter becomes a function of the difference of two frequencies and consequently any zero errors are eliminated.

3-18. The resistor R_{range}, in Figure 3-3, symbolizes the dual range capability of the Analog I.C. chip. This resistance, external to the chip, consists of series resistors R23, R57, R25, and R58. When the instrument is in the 2 volt basic range, all four resistors are used to scale the current to the V/F Converter. Variable resistor R25 is the calibration adjustment for this range. For operation in the 0.2 volt basic range, the switching provides a short across R25 and R58. Therefore, only resistor R57 and calibration adjustment R23 scale the current to the proper level for the V/F Converter.

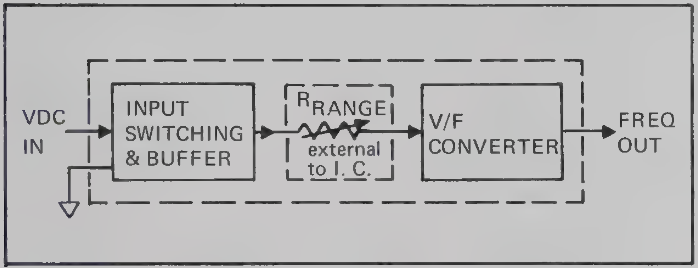


Figure 3-3. ANALOG I.C. BLOCK DIAGRAM

3-19. Timing circuitry for the A/D Converter is contained in the Analog Integrated Circuit. The connection between the Analog I.C. and the Digital I.C. is through R41, Q6, R56, and adjustment R20. Timing adjustment is accomplished by setting PERIOD adjust R20.

3-20. Overload protection for the Analog I.C. is provided by transistors Q20 and Q21. Negative overload voltages are handled by Q20 and positive overloads by Q21.

3-21. DIGITAL I.C. The output from the Analog I.C. alternates between the rest frequency during one time period and a frequency corresponding to the A/D Converter input voltage during the next period. Reversible counters in the Digital I.C. count these frequencies such that their difference is used to provide the BCD Information.

3-22. A four line BCD output (W-X-Y-Z on schematic) and a four line strobing pulse output (S1-S2-S3-S4 on schematic) are provided by the Digital I.C. to the Display section. The BCD lines W-X-Y-Z correspond to binary 8-4-2-1 positions, respectively.

3-23. Display

3-24. POLARITY. The polarity indicator consists of horizontal and vertical LED segments on DS1. These segments are strobed during the S1 time period, when the instrument is in the DCV or DC MA modes. The horizontal segment is used alone for a negative indication and together with the vertical segment to build a positive indication. Consequently, the horizontal segment must illuminate during each S1 time period. This is accomplished by S3D (DCV) or S4C (DC MA) which ground the cathodes of the horizontal LED segment. Illumination of the vertical segment relies upon the digital information provided by the Y BCD line during S1 time. When a positive voltage or current is applied to the INPUT terminals, the Y line goes high. This turns on Q8 and Q10 which allow the vertical segment to illuminate. With the Y line low, corresponding to a negative input, Q8 and Q10 are cut off and the vertical segment does not illuminate.

2-25. DECODER DRIVER. The Decoder Driver, U5, translates the BCD information on the W-X-Y-Z lines for application to the LED readouts

DS2, DS3, and DS4. Low inputs are provided by the Decoder Driver through a resistor network RN1 to the LED segments for construction of decimal numbers.

3-26. DECIMAL POINT. LED readouts DS2, DS3, and DS4 contain a decimal point segment. Illumination of a decimal point is controlled by the RANGE switch selected. This causes the resistor network RN2 to supply a negative voltage to the cathode of the decimal segment. Note on the schematic that the 20MΩ FUNCTION, which requires no RANGE selection, shares the 20 RANGE decimal point on DS2.

3-27. ANODE CONTROL. The Anode Control circuit, Q11 through Q18, applies +5 volts dc to the anodes of the LED readouts. Strobe pulses (S1-S2-S3-S4) from the Digital I.C. determine which readout receives the proper anode voltage at a particular time. The pulse sequence on the S lines is S1-S3-S2-S4 yielding a display sequence of DS1-DS3-DS2-DS4. For example: when S2 goes high Q12 and Q16 turn on and apply approximately +5 volts dc to the anodes of the LED segments on DS2. Those segments with negative voltages on their cathodes, at S2 time, will illuminate and form a decimal number.

3-28. LED READOUTS. The LED readouts DS2, DS3, and DS4 each contain seven and one-half diode segments. One-half segment for a decimal point and 7 segments to form decimal numbers. The number forming segments are designated A through G in each readout on the schematic.

3-29. Readout DS1 indicates the most significant digit (MSD) and polarity. Two segments form a numerical "1" and two segments to form the polarity signs. Control of the MSD "1" indication is separate from the other readouts. BCD information comes from the Z line during the S1 time period. When line Z is high during time S1, Q7, and Q9 turn on to allow the "1" segment to illuminate.

3-30. Signal Conditioning

3-31. INPUT VOLTAGE DIVIDER. Three series connected resistors (R1, R2, and R3) totaling 10 megohms are tapped to provide division ratios of 100 or 1000 to 1. Division ratios for each voltage range are tabulated in the schematic diagram, sheet 1.

3-32. Trimming capacitors are connected across the Input Voltage Divider to maintain a flat frequency response when used for ac voltages. High frequency compensation during calibration can be accomplished with variable trimmer capacitor C3.

3-33. CURRENT SHUNTS. The current shunts consist of resistors R44 through R48. Series connected resistors R44 through R47 are switched into the circuit, depending upon the RANGE selected. The resistor steps are 1000, 100, 10, and 1 ohms for the 0.2, 2, 20, and 200 milliampere ranges, respectively. A separate 100 milliohm four terminal shunt is used for the 2000 milliampere range.

3-34. The maximum voltage developed across a single shunt or combination for full range indication is 0.2 volts. Current overload protection above 2 amperes is provided by fuse F2. The shunts are protected against over-voltage by diodes CR9 through CR12.

3-35. AC CONVERTER. The AC Converter consists of a buffer and an active rectifier (refer to Figure 3-4). Transistor Q1, connected as a voltage follower, operates as a buffer for the active rectifier. The buffer output is applied as a voltage, e_{in}, to the non-inverting input of operational amplifier U1. Negative feedback causes the voltage at the inverting input to follow the non-inverting input, causing a current, $e_{in}/R2$, through R2 to ground. Since diodes CR1 and CR2 conduct on alternate half cycles, one-half the average current flows through R1. The rectified voltage developed across R1 is filtered by R3 and C1 to produce the dc voltage required for the A/D Converter.

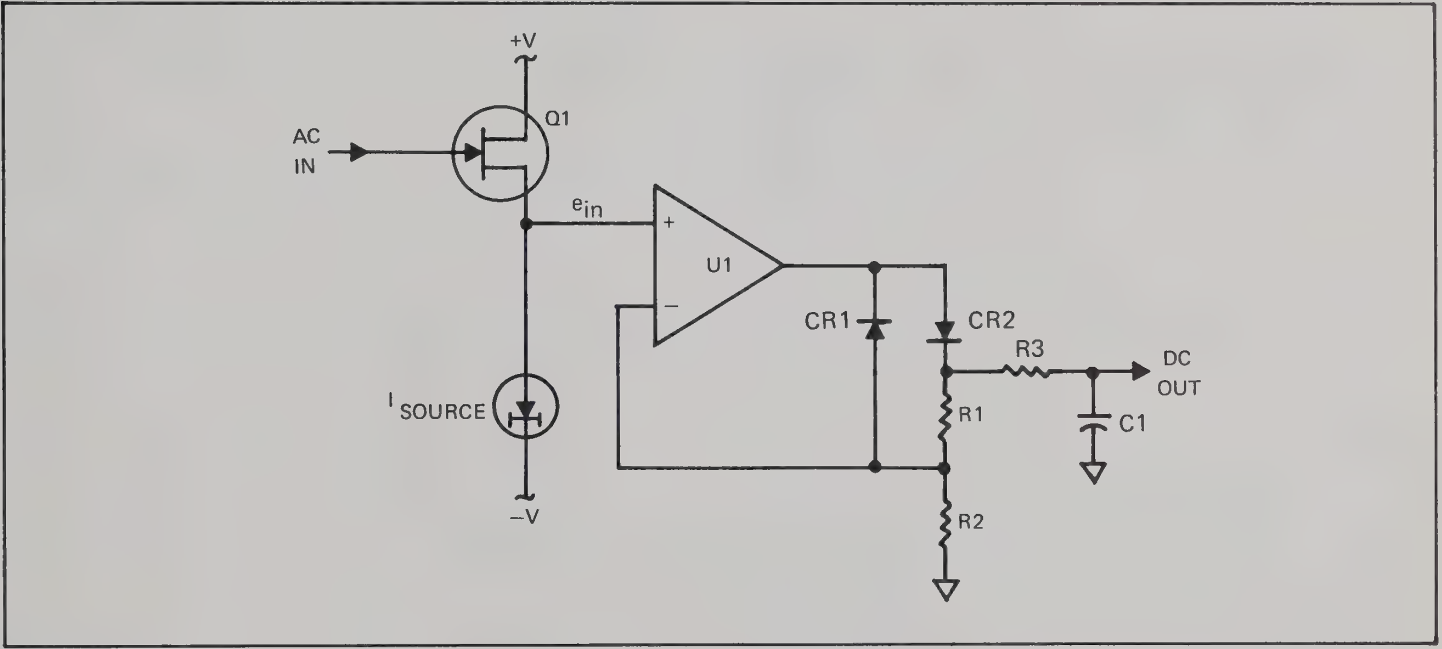


Figure 3-4. AC CONVERTER SIMPLIFIED DIAGRAM

3-36. The input to the AC Converter is in either the 0.2 volt or 2 volt basic range. To accommodate either range, the gain of the operational rectifier is adjusted accordingly by changing the feedback resistor (symbolized by R1). In the instrument, R51 sets the gain at 1 for the 2 volt basic range. For the 0.2 volt basic range, the gain is increased to 10 by switching R50 in parallel with R51.

3-37. OHMS CONVERTER. The Ohms Converter supplies a dc voltage, proportional to the unknown resistance, to the A/D Converter. A simplified diagram of the circuit elements involved is illustrated in Figure 3-5. Operational Amplifier U2 bootstraps the current source. With the non-inverting input connected to the junction of R_A and R_X, current will flow through R_A and R_X such that a constant voltage is maintained across R_A for a given RANGE. If R_X is within the RANGE selected, the voltage developed will be proportional to the value of R_X. For resistance ranges 200 ohms through 2000 kilohms, the constant voltage maintained is 10 volts. In the 20 megohm range, U2's feedback resistor, R_F, is changed so that a 1 volt potential is maintained.

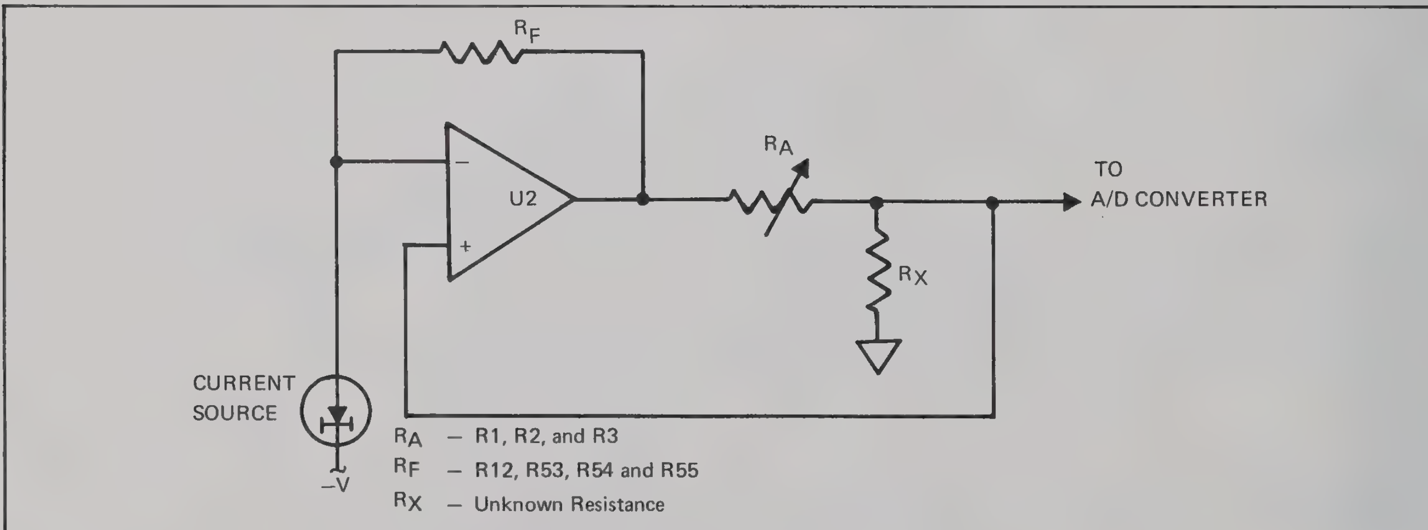


Figure 3-5. OHMS CONVERTER SIMPLIFIED DIAGRAM

3-38. ACTIVE FILTER. The Active Filter ensures that the input to the A/D Converter receives only dc voltages. The operational amplifier (U2) used for the Ohms Converter is also used in conjunction with R18, C11, R19, and C12 to form a two pole Bessel type active filter (see Figure 3-6). A cutoff frequency of 10Hz and a 60Hz rejection ratio of 32db is provided by this filter. Normal mode rejection at frequencies other than even multiples of the integration period is also provided. Overloading of the A/D Converter by large ripple voltages is prevented by the filter.

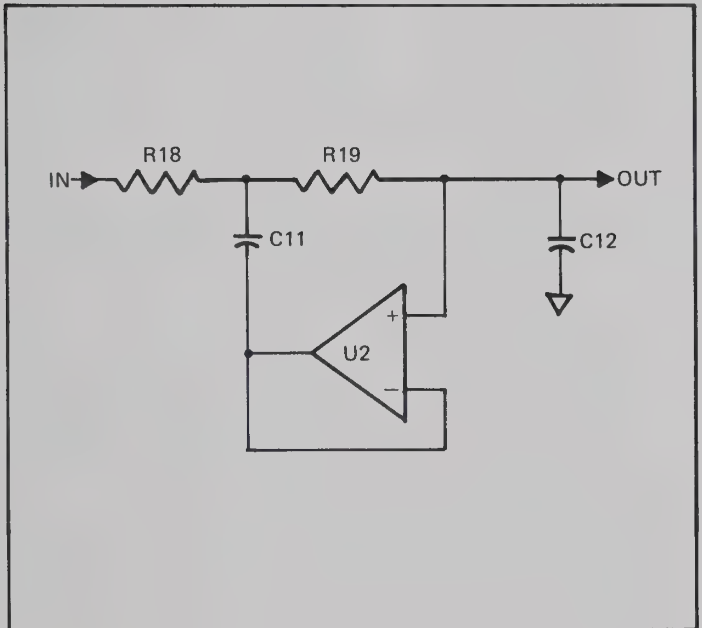


Figure 3-6. ACTIVE FILTER SIMPLIFIED DIAGRAM

3-39. Power Supply

3-40. LINE POWER. The line power supply, shown in sheet 2 of the schematic diagram, provides ±15 and +5 volts dc. Diode bridge CR15 through CR18 and filter capacitors C17 and C18 supply an unregulated ±15 volts. Further conditioning by Q19, CR19, Q24, and CR8 provide the regulated ±15 volts dc. Diodes CR13 and CR14, and filter capacitor C19 supply an unregulated +5 volts.

3-41. BATTERY POWER. The Model 8000A–01 utilizes the battery operated power supply diagrammed on the schematic. With the POWER switch ON, the battery is connected to the input of the dc to dc converter consisting of Q22, Q23, T2, CR15 through CR18, C17, and C18. Transistors Q22 and Q23 and transformer T2 form a 4kHz multivibrator. The multivibrator signal is coupled by T2 to the diode rectifiers CR15 through CR18. Capacitors C17 and C18 filter the rectified voltage to supply the ±15 volts. The unregulated +5 volts is supplied by the battery. The battery is charged whenever the instrument is connected to ac line power. Transformer T1, CR13, and CR14 provide the rectified voltage. A lamp, DS5, in parallel with R21 acts as a dynamic current control that limits the charging current to approximately 450 milliamperes. With the instrument connected to line power and the POWER switch OFF, approximately 400 to 450 milliamperes can be supplied to a discharged battery.

3-42. DPOU (Option –02)

3-43. GENERAL. Digits, polarity, and overload data from the 8000A are applied to the WXYZ input lines of the DPOU. Most significant digit (MSD), overload and polarity data arrive at the beginning of each measurement cycle during the S1 strobe period. Information for second, third, and fourth digits arrives during the S2, S3, and S4 periods, respectively. This data is applied through buffers to a pair of dual 4-bit shift registers (see schematic 8000A–1012). Data is loaded and shifted when clock pulses, at S, are applied to the Cp inputs of the registers.

3-44. DATA TRANSFER SEQUENCE. Setting the Data Update line low causes U1-5 to go high. When the next $\overline{T}$ positive transition occurs (see Timing Diagram, Figure 3-7), this high is transferred to U1-9. Occurance of the S1 strobe pulse causes a low at U1-12. This low is inverted to a high at U4-12 which causes a reverse bias condition across CR1. With CR1 reverse biased, the clock pulses from S are applied to the registers to allow loading of new data and shifting of previous data to the DPOU output. During this time the low at U1-12 is inverted by U8 to provide a Busy Flag. When the S4 period begins, an S4 pulse resets U1-4. At the end of the S4 period, an S4 pulse resets U1 at pin 4. This sets up U1-5 to accept another external command and cause the data transfer sequence to repeat. Should an S4 pulse occur before an S1 pulse, Diode CR2 will clamp this pulse and prevent the reset of U1-5. Continuous updating at the internal rate of the DPOU, six times per second, occurs when the Continuous Update line is held low.

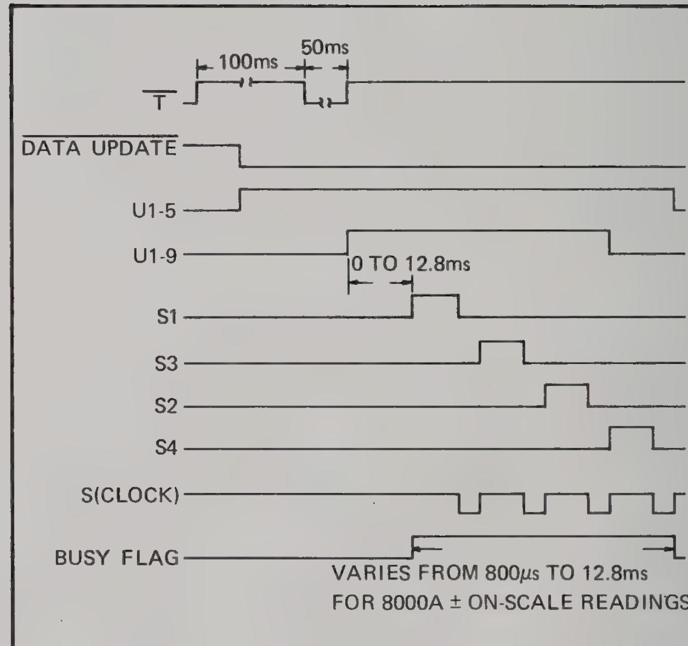


Figure 3-7. DPOU TIMING DIAGRAM

Section 4
Maintenance

4-1. INTRODUCTION

4-2. This section contains information concerning preventive and corrective maintenance for the Model 8000A Digital Multimeter. A maintenance interval of one year for calibration is recommended to ensure instrument operation within the one year specifications. Equipment for performing maintenance tests and adjustments is listed in Table 4-1. If this equipment is not available, other equipment having equivalent specifications may be used.

4-3. SERVICE INFORMATION

4-4. A unique 48 hour turnaround service is provided for the Model 8000A. Should your instrument need repair, send it to the nearest factory authorized service center. A list of these authorized service centers is located on the inside of the front cover. Also located on the inside front cover is the WARRANTY which warrants the instrument for a period of one year. In order for the warranty to become effective, the validation card included with the manual must be completed and returned to the John Fluke Mfg. Co., Inc.

Table 4-1. TEST EQUIPMENT

EQUIPMENT NOMENCLATURE	USE	SPECIFICATIONS	RECOMMENDED EQUIPMENT
DC Voltage Source	Calibration, Performance Checks, Troubleshooting	190mV to 1200V ±0.03%	Fluke Model 341A
DC Current Source	Calibration, Performance Checks	190μA to 1.9A ±0.1%	Fluke Model 382A
AC Voltage Source	Calibration, Performance Checks	190mV to 1200V (45Hz to 10kHz) ±0.1% 190mV to 1200V (10kHz to 20kHz) ±0.2%	Fluke Models 5200A/5205A
AC Current Source	Performance Checks	190μA to 190mA (100Hz to 10kHz) ±0.3% 1.9A (100Hz to 3kHz) ±0.3%	Optimation AC 105, and Fluke Models 540B, 382A, A45, and A40 shunts (20mA, 200mA, and 2A)
Resistors	Calibration	190Ω, 1.9kΩ, 19kΩ, 1.9MΩ, and 19MΩ ±0.1%	
Frequency Counter	Calibration	To measure positive 100 msec. pulse with 1μsec resolution	Fluke Model 1952A
Oscilloscope	Troubleshooting	General Purpose	Tektronix 545B W/1A1 plug-in

4-5. GENERAL MAINTENANCE

4-6. Access

4-7. Use the following procedure to gain access to the interior of the Model 8000A.

a. With the power switch OFF, disconnect the line cord.

b. Remove the Phillips screw at the rear of the instrument case.

c. Remove the instrument from the case.

4-8. Cleaning

4-9. Clean the front panel and case with denatured alcohol or mild solution of detergent and water. Do not use aromatic hydrocarbons or chlorinated solvents because they will react with the plastic materials of the instrument.

4-10. Fuse Replacement

4-11. The input power fuse, F1, is located within the instrument in a fuse clip near the power transformer (T1). To gain access to the fuse, refer to paragraph 4-6. When replacement is required, install AGC 1/8A (fast acting) for line powered instruments. Use MDL 1/8A (slow blow) for battery powered instruments.

4-12. The current shunt protection fuse, F2, is located behind the front panel. To remove the fuse, turn the MA input terminal in the direction indicated on the front panel. When replacement is required, install AGW2A as indicated on the front panel and on the decal on the underside of the instrument case.

4-13. Battery Replacement (Option 8000A–01)

4-14. Follow the disassembly instructions below for removing the replaceable batteries in the Model 8000A–01.

CAUTION!

Damage may result if alkaline, zinc-carbon or mercury batteries are charged.

a. Disconnect line cord. Remove retaining screw at rear of instrument case, and remove instrument from case.

b. On the underside of the PCB, remove the two threaded bolts securing the battery holders.

c. Remove the holder tops and batteries.

d. Replace the batteries with 1.2 volt nickel-cadmium batteries (JF Part No. 346924). Install the batteries in the polarity indicated on the battery holder.

4-15. Optional Modifications (Option 8000A–02)

4-16. READY FLAG

4-17. The DPOU can be modified to provide a Ready Flag in place of the Busy Flag. To modify the DPOU, use the following instructions:

a. Disconnect line cord. Remove retaining screw at rear of instrument case, and remove instrument from case.

b. Locate DPOU pcb (use Figure 5-3 for reference).

c. Locate and cut jumper wire at J1 (between U1 and RN2).

d. Complete modification by installing jumper wire at J2.

e. Install instrument in case.

4-18. Pin 13 of DPOU output connector will be the Ready Flag. Logic "1" will be ready and logic "0", not ready.

4-19. EXTERNAL PULLUP VOLTAGE

4-20. A pullup voltage to 15 volts maximum can be provided by modifying the DPOU. The modification allows connection of an external voltage source to pin 1 of the DPOU output connector. Follow the procedure below for modifying the DPOU.

a. Disconnect line cord. Remove retaining screw at rear of instrument case, and remove instrument from case.

b. Locate DPOU pcb (use Figure 5-3 for reference).

c. Locate and cut jumper wire at J3 (near RN3, R5, and R7).

d. Complete modification by installing jumper wire at J4.

e. Install instrument in case.

4-21. PERFORMANCE CHECKS

4-22. Environmental Conditions

4-23. The environmental conditions for conducting the performance checks are as follows:

a. Ambient Temperature, 22°C to 25°C (72°F to 77°F)

b. Relative Humidity, less than 70%

4-24. Zero Offset Checks

a. With instrument energized, depress DCV and 200MV pushbuttons.

b. Short V–Ω to COMMON. Readout should indicate 00.0, flashing ±00.1 not more than 10 times in 10 seconds.

c. Remove short. Readout should indicate less than or equal to ±01.0.

4-25. Accuracy Checks

4-26. The accuracy checks compare the instruments performance to the accuracy specifications listed in Section 1. Use Table 4-3, disregarding the "ADJUSTMENT" column, since the display limits for a given input are listed. For the AC current performance checks, refer to Table 4-2, AC MA PERFORMANCE CHECKS.

Table 4-2. AC MA PERFORMANCE CHECKS

FUNCTION/RANGE	INPUT	DISPLAY LIMITS
AC MA/200μA	190μA @ 100 Hz	187.9 to 192.1
AC MA/200μA	190μA @ 10 kHz	187.9 to 192.1
AC MA/2	1.9mA @ 100 Hz	1.879 to 1.921
AC MA/2	1.9 mA @ 10 kHz	1.879 to 1.921
AC MA/20	19 mA @ 100 Hz	18.79 to 19.21
AC MA/20	19 mA @ 10 kHz	18.79 to 19.21
AC MA/200	190 mA @ 100 Hz	187.9 to 192.1
AC MA/200	190 mA @ 10 kHz	187.9 to 192.1
AC MA/2000 MA	1.9 A @ 100 Hz	1879 to 1921
AC MA/2000 MA	1.9A @ 3 kHz	1879 to 1921

4-27. CALIBRATION

4-28. Environmental Conditions

4-29. Instrument calibration should be accomplished within the following environmental conditions.

a. Ambient Temperature, 22°C to 25°C (72°F to 77°F)

b. Relative Humidity, less than 70%

4-30. Period Adjustment

a. Connect a frequency counter, set for time interval measurement, between TP5 (see Figure 4-1) and COMMON (or TP4).

b. Adjust R20, PERIOD, for a 100,000 microsecond indication on counter ±5 microseconds. Variation in the indication should be less than or equal to ±15 microseconds.

4-31. Zero Offset (Use Code C)

4-32. Use the following procedure for instruments with serial numbers listed under Use Code C. Refer to Table 5-1, Section 5, for these numbers.

a. Disconnect line cord. Remove retaining screw at rear of instrument case, and remove instrument from case.

b. Connect instrument to line power and select DCV and 200 MV pushbuttons.

WARNING!

Instrument power connector is at line potential (100, 115, or 230 volts ac). Use caution when working in this area.

c. Short V–Ω to COMMON.

d. Readout should indicate 00.0, flashing ±00.1 not more than 10 times in 10 seconds.

e. Remove INPUT short. Readout should indicate less than or equal to ±01.0.

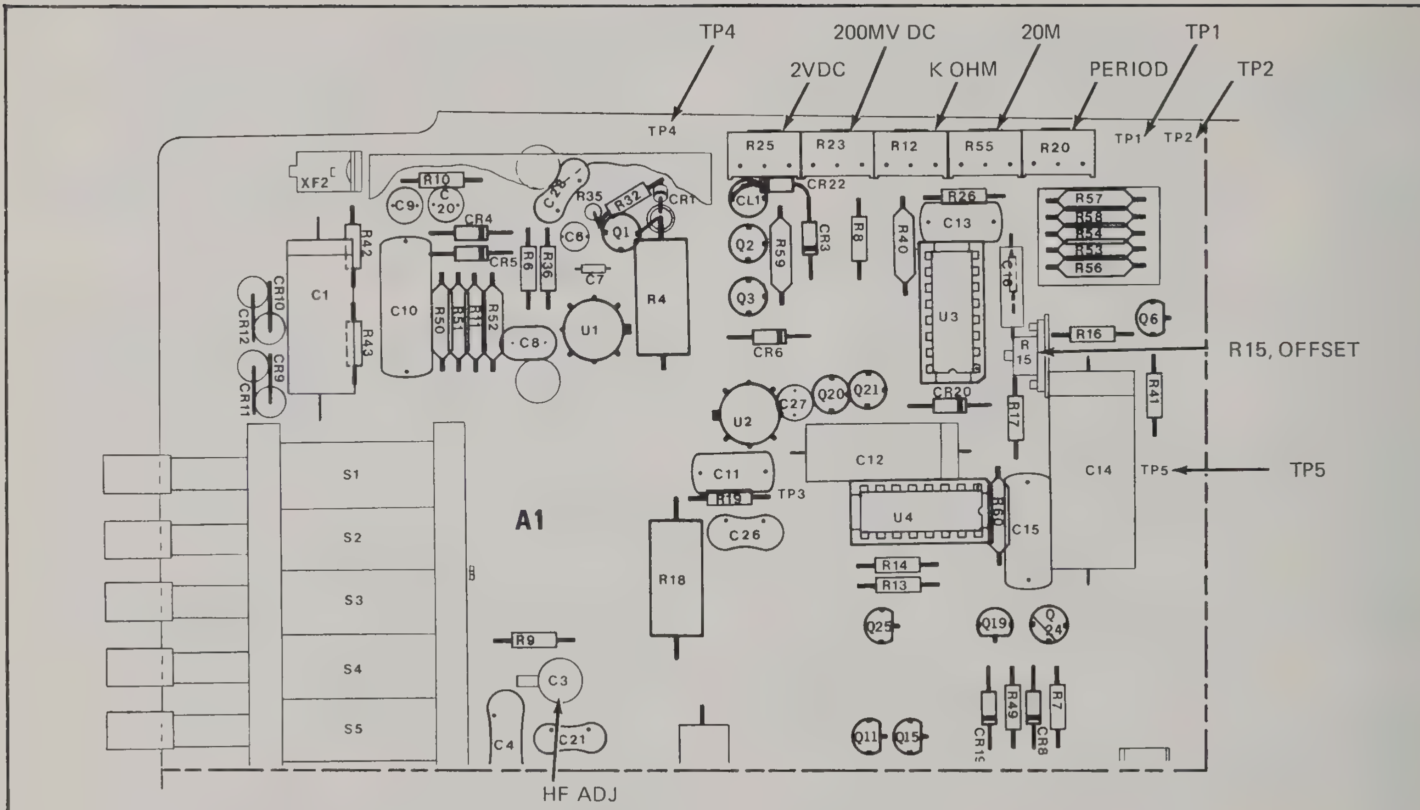


Figure 4-1. ADJUSTMENT AND TEST POINT LOCATIONS

4-33. Zero Offset (Use Code D)

4-34. Use the following procedure for instruments with serial numbers listed under Use Code D. Refer to Table 5-1, Section 5, for these numbers.

a. Disconnect line cord. Remove retaining screw at rear of instrument case, and remove instrument from case.

b. Connect instrument to line power and select DCV and 200 MV pushbuttons.

WARNING!

Instrument power connector is at line potential (100, 115, or 230 volts ac). Use caution when working in this area.

c. Short V-Ω to COMMON.

d. Readout should indicate 00.0, flashing ±00.1 not more than 10 times in 10 seconds. If instrument meets these limits, go to step f. If instrument does not meet these limits, complete steps e and f.

e. Adjust R15 (for location, see Figure 4-1) for readout of 00.0, flashing ±00.1 not more than 10 times in 10 seconds.

f. Remove INPUT short. Readout should indicate less than or equal to ±01.0.

4-35. Turn-Over Error (Use Code C)

4-36. Use the following procedure for instruments with serial numbers listed under Use Code C. Refer to Table 5-1, Section 5, for these numbers.

a. Select VDC and 200 MV pushbuttons and apply +190 millivolts between V–Ω and COMMON terminals.

b. Adjust R25 (for location, see Figure 4-1) for +190.0 on readout.

c. Remove +190 millivolt input and apply –190 millivolts.

d. Instrument should indicate within +190.1 to –190.1 on readout.

4-37. Turn-Over Error (Use Code D)

4-38. Use the following procedure for instruments with serial numbers listed under Use Code D. Refer to Table 5-1, Section 5, for these numbers.

a. Follow steps a through d of paragraph 4-36.

b. If instrument is within limits of paragraph 4-36, step d, proceed to paragraph 4-39, Range Adjustments/Checks. If not within limits, continue with the following steps.

c. Change offset adjustment, R15, to bring instrument within +190.1 to –190.1 on readout.

d. Recheck Zero Offset (Use Code D), paragraph 4-33.

4-39. Range Adjustments/Checks

4-40. Refer to Figure 4-1 for the location of range adjustments. Table 4-3 lists the order of the adjustments and cardinal check points. Apply the inputs listed, adjust and check for in-limits indications.

4-41. Troubleshooting

4-42. Insure that the malfunction is within the instrument and not due to operator error, faulty test leads, etc. Careful observation of the front panel, while actuating controls, can aid in localizing a problem area to one

Table 4-3. CALIBRATION

FUNCTION/RANGE	INPUT	ADJUSTMENT	DISPLAY LIMITS
DCV / 200 MV	+190 MV	"200 MVDC" (R23) Adjust for +190.0	+189.7 to +190.3
DCV / 2	+1.9V dc	"2 VDC" (R25) Adjust for +1.900	+1.897 to +1.903
DCV / 20	+19V dc	--------	+18.97 to +19.03
DCV / 200	+190V dc	--------	+189.7 to +190.3
DCV / 1200V	+1000V dc	--------	+998 to +1002
20MΩ	19MΩ	"20 M" (R55) Adjust for 19.00	18.89 to 19.11
KΩ / 20	19KΩ	"K OHM" (R12) Adjust for 19.00	18.95 to 19.05
KΩ / 200Ω	190Ω	--------	189.5 to 190.5
KΩ / 2	1.9KΩ	--------	1.895 to 1.905
KΩ / 200	190KΩ	--------	189.5 to 190.5
KΩ /2000KΩ	1.9MΩ	--------	1895 to 1905
DC MA / 200μA	+190μA	--------	+189.3 to +190.7
DC MA / 2	+1.9mA	--------	+1.893 to +1.907
DC MA / 20	+19mA	--------	+18.93 to +19.07
DC MA / 200	+190mA	--------	+189.3 to +190.7
DC MA / 2000 MA	+1.9A	--------	+1893 to 1907
ACV / 200 MV	190mV @ 100Hz	--------	188.8 to 191.2
ACV / 200 MV	190mV @ 20kHz	--------	187.9 to 192.1
ACV / 2	1.9V @ 100 Hz	--------	1.888 to 1.912
ACV / 2	1.9V @ 20kHz	--------	1.879 to 1.921
ACV / 20	19V @ 20kHz	"HF ADJ" (C3) Adjust for 19.00	18.79 to 19.21
ACV / 20	19V @ 10 kHz	--------	18.79 to 19.21
ACV / 200	190V @ 10 kHz	--------	187.9 to 192.1
ACV / 200	190 @ 20 kHz	--------	187.9 to 192.1
ACV / 1200V	1000V @ 100 Hz	--------	993 to 1007
ACV / 1200V	1000V @ 10 kHz	--------	988 to 1012

of the five functions. A troubleshooting procedure for isolating an incomplete display problem is described in Figure 4-2.

4-43. Component Replacement

4-44. There are three matched component sets in the Model 8000A instruments. These are the Input Divider Resistor Set, Analog Resistor Set, and Ohms Resistor Set. When replacement is required, the complete set must be replaced.

4-45. Analog I.C.'s and Digital I.C.'s received as replacements are packed in conductive foam to protect them from damage by static discharge. These components should not be removed from the conductive foam until needed for replacement. At that time, personnel handling the devices and the working surface must be grounded.

CAUTION!

When soldering or desoldering on the Model 8000A–01 PCB, either remove one of the batteries or place a thin insulating material between a battery and the holder contact.

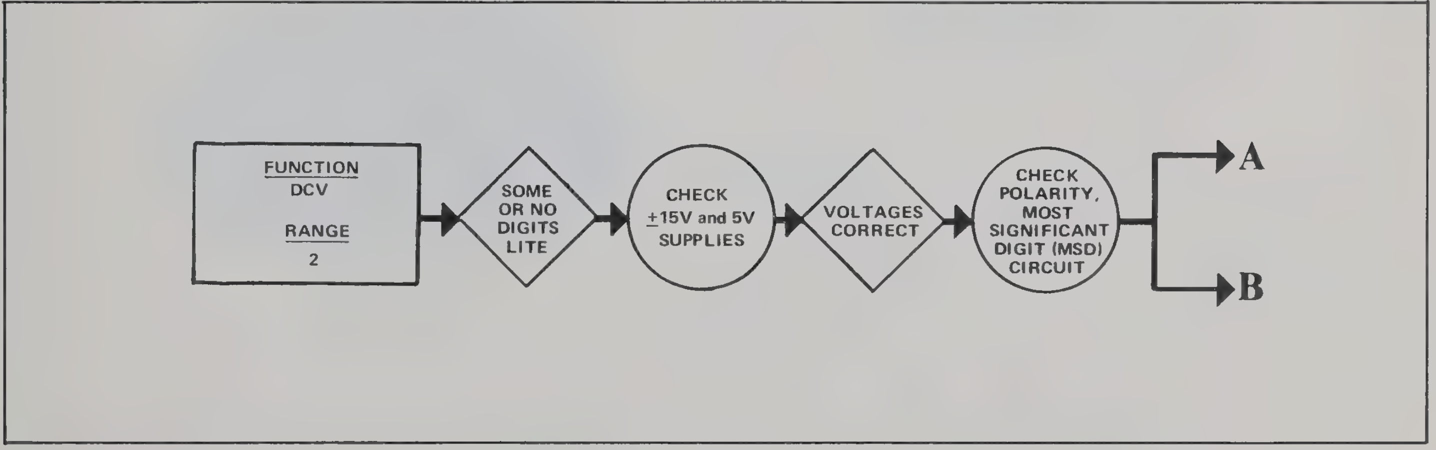


Figure 4-2. TROUBLESHOOTING CHART (1 of 2)

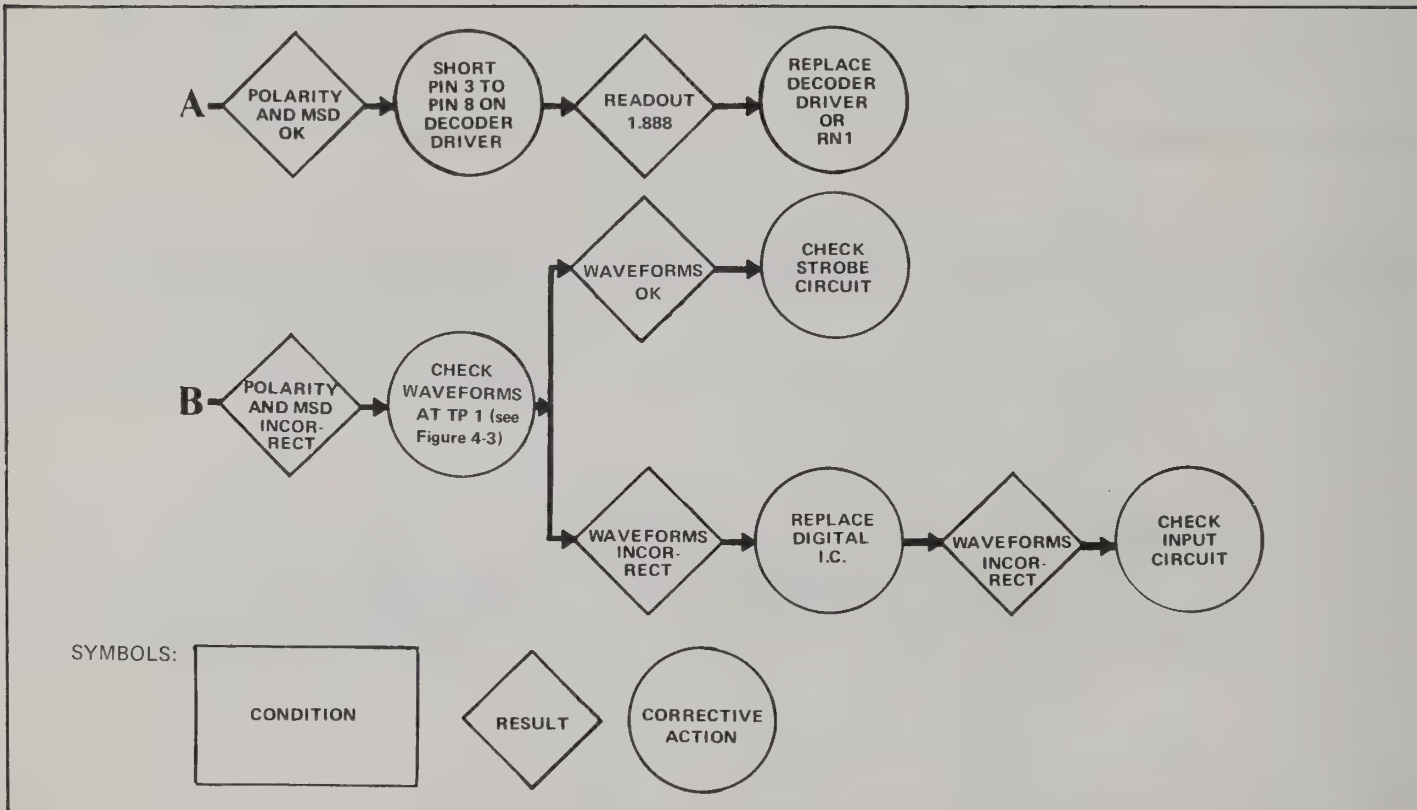
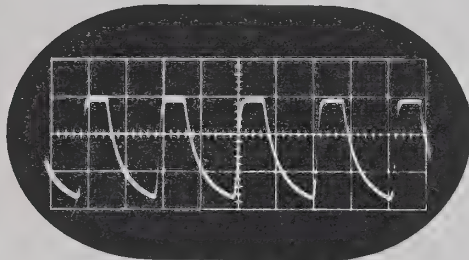
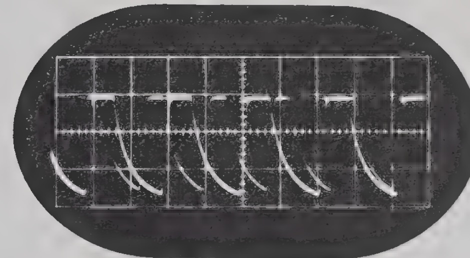


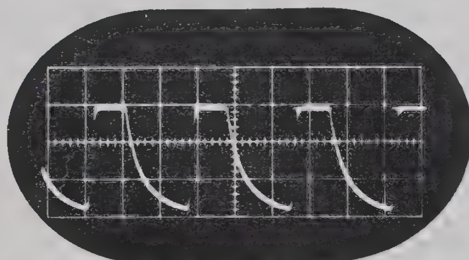
Figure 4-2. TROUBLESHOOTING CHART (2 of 2)



ZERO INPUT



— INPUT VOLTAGE
CAUSES INCREASE
IN FREQUENCY
FROM ANALOG I.C.



+ INPUT VOLTAGE
CAUSES DECREASE
IN FREQUENCY
FROM ANALOG I.C.

SCOPE SWITCH SETTINGS

COUPLING	TRIGGER	HORZ	VERT
AC	–AC	5μsec/cm	5V/cm

Figure 4-3. TP1, OSCILLOSCOPE WAVEFORMS

Section 5
Lists of Replaceable Parts

5-1. INTRODUCTION

5-2. The parts list contains a complete breakdown of all the major assemblies followed by subsequent listings that itemize the components on each major assembly. Assemblies and subassemblies are identified by a reference designation beginning with the letter A followed by a number (e.g., A1 etc.). Electrical components appearing on the schematic diagram are identified by their schematic diagram reference designation. Flagnotes are used throughout the parts list and refer to special ordering explanations.

5-3. COLUMN DESCRIPTION

a. REF DESIG: indexes the item description to the associated illustration.

b. DESCRIPTION: describes the salient characteristics of the component. Indention of the description indicates the relationship to other assemblies, components, etc. Those component descriptions that are unique to a particular model are designated by the model number in paranthesis following the description, such as (8000A –01).

c. STOCK NO: the six-digit part number by which the item is identified at the John Fluke Mfg. Co.

d. MFR: the Federal Supply Code for the manufacturer. Appendix A lists the code numbers and the corresponding manufacturer.

e. MFR PART NO: part number by which the item is identified by the manufacturer.

f. TOT QTY: lists the total quantity of the item and reflects the latest Use Code. Second and subsequent listings of the same item are referenced to the first listing with the abbreviation REF.

g. REC QTY: indicates the recommended number of spare parts necessary to support one to five instruments for a period of two years. This list presumes an availability of common electronic parts at the maintenance site.

h. USE CODE: identifies certain parts which have been added, deleted or modified during the production of the instrument. Each part for which a Use Code has been assigned may be identified with a particular instrument serial number by consulting the Serial Number Effectivity List, Table 5-1. All parts with no code are used on all instruments with serial numbers above 123.

5-4. HOW TO OBTAIN PARTS

5-5. Standard components may be ordered directly from the manufacturer's part number, or parts may be ordered from the John Fluke Mfg. Co. factory or authorized representative by using the Fluke part number. In the event the part you order has been replaced by a new or improved part, the replacement will be accompanied by an explanatory note and installation instructions, if necessary.

5-6. You can insure prompt and efficient handling of your order to the John Fluke Mfg. Co. if you include the following information: Quantity, FLUKE Stock Number, Description, Reference Designation and Instrument model and serial number. If you must order structural parts not listed in the parts list, describe the part as completely as possible.

Table 5-1. SERIAL NUMBER EFFECTIVITY LIST.

USE CODE	SERIAL NUMBER EFFECTIVITY
A	56400 and on
B	62300 and on
C	123 thru 644330, 64390 thru 66244, and 66845 thru 67784
D	64340 thru 64389, 66245 thru 66844, 67785 and on
E	60700 and on
F	68700 and on
G	123 thru 69999
H	70000 and on

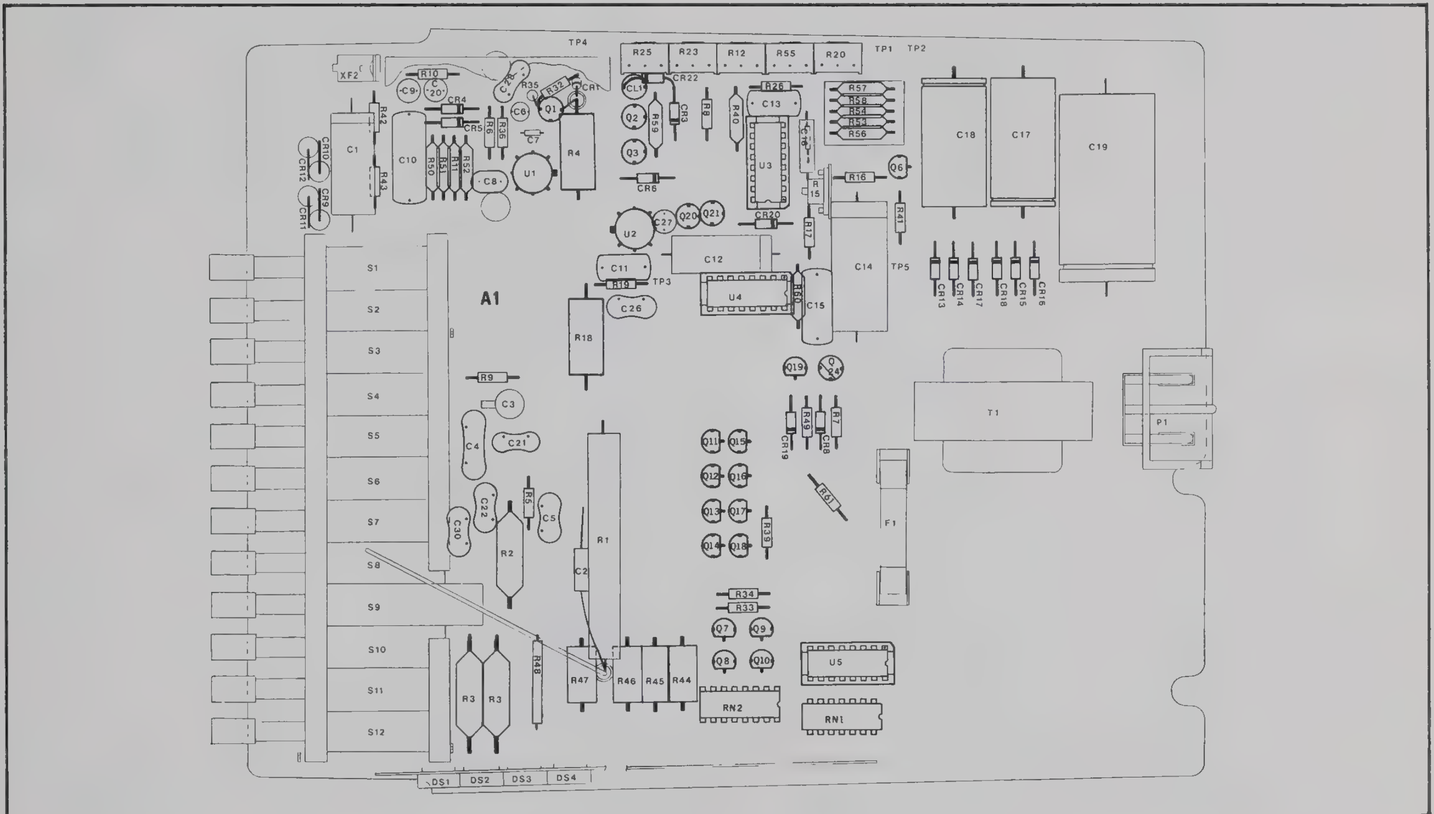


Figure 5-1. 8000A MAIN PCB ASSEMBLY

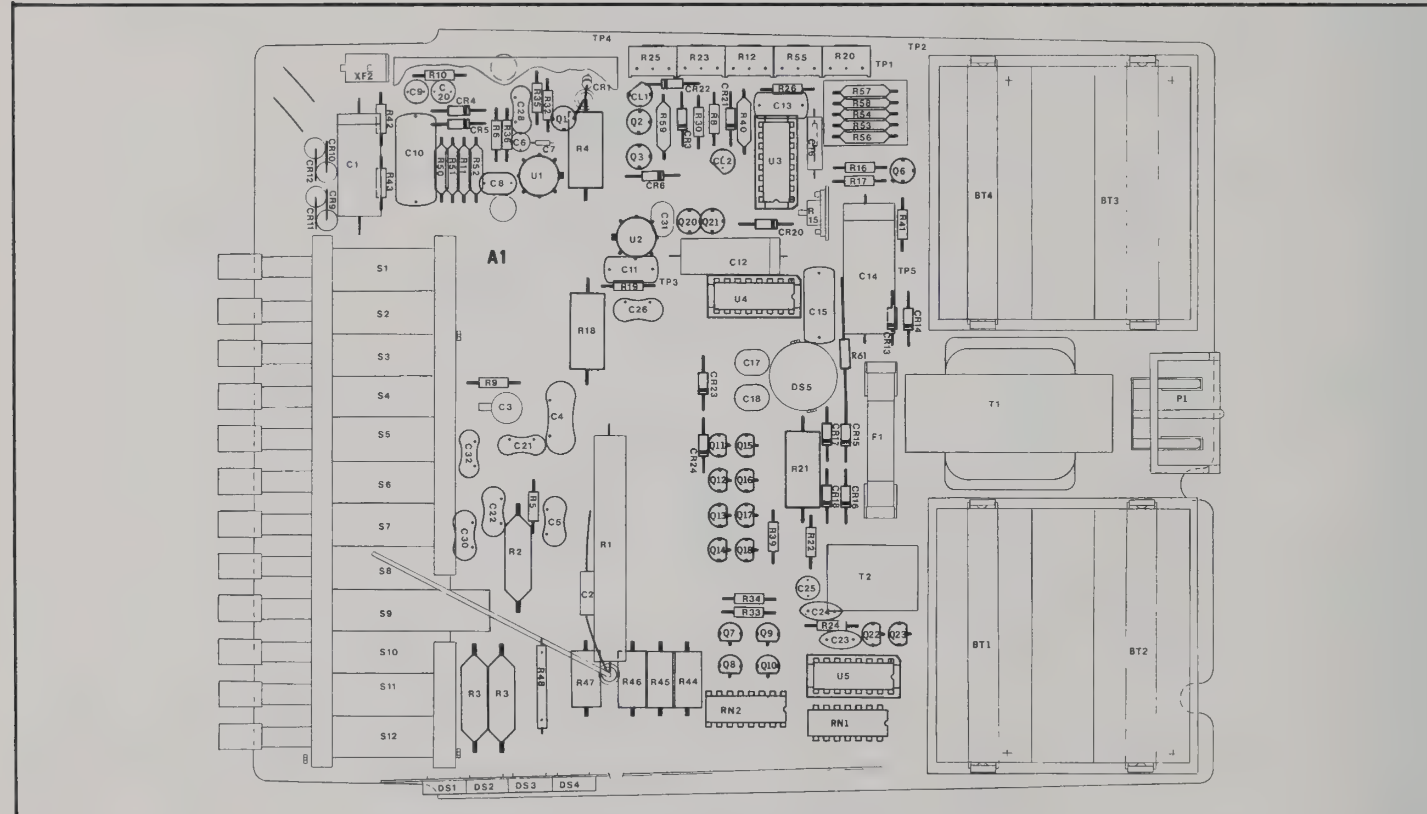


Figure 5-2. 8000A–01 MAIN PCB ASSEMBLY

8000A DIGITAL MULTIMETER INSTRUCTION MANUAL

REF DESIG OR ITEM NO.	DESCRIPTION	FLUKE STOCK NO.	MFG FED SPLY CDE	MFG PART NO. OR TYPE	TOT QTY	REC QTY	USE CDE
	8000A DIGITAL MULTIMETER INSTRUCTION MANUAL	347906	89536	347906	1		
	DIGITAL MULTIMETER Figure 5-1 & Figure 5-2	8000A & 8000A 01					
A1	Main PCB Assembly (8000A)	364562	89536	364562	1		
	Main PCB Assembly (8000A/10)	364588	89536	364588	1		
	Main PCB Assembly (8000A/23)	346114	89536	346114	1		
	Main PCB Assembly (8000A–01)	364570	89536	364570	1		
	Main PCB Assembly (8000A–01/10)	364596	89536	364570	1		
	Main PCB Assembly (8000A–01/23)	346098	89536	364089	1		
A2	Front Panel Assembly	———	——	———			
A3	Display Assembly	338376	89536	338376	1		
	Case, molded	330076	89536	330076	1		
	Handle, molded	330092	89536	330092	1		
	Line Cord Assembly	343723	89536	343723	1		
	Line Cord Assembly (/10 & /23 only)	343780	89536	343780	1		
	Pad, foot	338632	89536	338632	4		
	Test Lead Set	343657	89536	343657	1		
A1	MAIN PCB ASSEMBLY	REF					
BT1	Battery, Ni Cd, 1.2V (8000A–01)	346924	89536	346924	4		
BT2	Battery, Ni Cd, 1.2V (8000A–01)	346924	89536	346924	REF		
BT3	Battery, NiCd, 1.2V (8000A–01)	346924	89536	346924	REF		
BT4	Battery, Ni Cd, 1.2V (8000A–01)	346924	89536	346924	REF		
C1	Cap, plstc, 0.033µf, 1200V	352120	01281	JF83	1		
C2	Cap, porcelain, 5.1pf 1V	347948	89536	347948	1		
C3	Cap, var, cer, 4.5 to 50pf + 70/–20%	321117	73899	DVJ305A	1	1	
C4	Cap, mica, 560pf ±5%, 500V	170431	14655	CD19F561J	1		C
C4	Cap, mica, 510pf ±5% 500V	148411	14655	CD19F510J	1		D
C5	Cap, mica, 56pf ±5%, 500V	148528	14655	CD15F560J	1		

8000A DIGITAL MULTIMETER INSTRUCTION MANUAL

REF DESIG OR ITEM NO.	DESCRIPTION	FLUKE STOCK NO.	MFG FED SPLY CDE	MFG PART NO. OR TYPE	TOT QTY	REC QTY	USE CDE
C6	Cap, ta, 0.22µf, ±20% 35V	161331	56289	196D224X0035	1		
C7	Cap, cer, 33pf, ±20%, 100V	354852	80031	2222-638-10339	1		
C8	Cap, ta 68µf ±10%, 15V	193615	56289	196D686X0015	1		
C9	Cap, ta, 10µf ±20%	330662	12954	D10GSB20M	3		
C10	Cap, plstc, 0.07µf ±10%, 250V	184366	73445	C280AE/A470K	1		
C11	Cap, plstc, 0.033µf ±10%, 50V	271841	06001	75F1R5A334	1		
C12	Cap, poly, 0.022µf ±10%, 100V	333823	02799	1PJ223K	1		
C13	Cap, plstc, 0.047µf ±10%, 250V	271858	06001	75F1R5A474	1		
C14	Cap, fxd, poly, 0.22µf ±5%, 50	348359	13934	H8S0R22350 V5PCT	1		
C15	Cap, plstc, 0.22µf ±10%, 250V	194803	73445	C280AE/A220K V5PCT	REF		
C16	Cap, cer, 390pf ±5%, 50V	352880	72982	8045-C0G0391J	1		
C17	Cap, elect, 470µf, -10% +50%, 25V (8000A)	168153	23445	ET471X025A01	2	1	
C17	Cap, ta, 47µf ±20%, 20V (8000A–01)	348516	56289	196D476X0020 LA3	2		
C18	Cap, elect, 470µf, -10% +50%, 25V (8000A)	168153	73445	ET471X025A01	REF		
C18	Cap, ta, 47µf ±20%, 20V (8000A–01)	348516	56289	196D476X0020 LA3	REF		
C19	Cap, elect, 4000µf, 500mA, 10V (8000A)	330761	99392	61C10A543	1	1	
C20	Cap, ta, 10µf ±20%	330662	12954	D10GSB20M	REF		
C21	Cap, mica, 39pf ±5%, 500V	148544	14655	CD15E390J	2		
C22	Cap, mica, 390pf ±5%, 500V	148437	14655	CD15F391J	1		
C23	Cap, cer, 0.001µf ±10%, 500V (8000A–01)	357806	71590	CF122	2		
C24	Cap, cer, 0.001µf ±10%, 500V (8000A–01)	357806	71590	CF122	REF		
C25	Cap, ta, 10µf ±20% (8000A–01)	330662	12954	D10GSB20M	REF		
C26	Cap, mica, 100pf ±5%, 500V	148494	14655	CD15F101J	1		
C27	Cap, ta, 10µf ±20% (8000A)	330662	12954	C10GSB20M	REF		

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REF DESIG OR ITEM NO.	DESCRIPTION	FLUKE STOCK NO.	MFG FED SPLY CDE	MFG PART NO. OR TYPE	TOT QTY	REC QTY	USE CDE
C28	Cap, mica, 22pf ±5%, 500V	148551	14655	CD15E220J	1		
C29	Not used						
C30	Cap, mica, 240pf, ±5%, 500V (8000A–01)	362863	14655	CD15E241J	1		D
C31	Cap, ta, 47μf, ±20% (8000A–01)	348516	56289	1960476X002 LA2	REF		A
C32	Cap, mica, 39pf, ±5%, 500V	148544	14655	CD15E390J	REF		
CL1	Diode, FED, cur. reg. 1000mA ±20%	348482	17856	E505	2	1	
CL2	Diode, FED. cur. reg, 1000mA ±20% (8000A–01)	348482	17856	E505	REF		
CR1	Diode, si, 75mA, 25V piv	241422	03508	1N4009	4	1	C
CR1	Diode, si, sm/sig	348177	03508	DA2429	4	2	D
CR2	Diode, zener, 10V ±5%	246611	07910	1N961B	1	1	C
CR3	Diode, part of matched set, See 2	———	——	———			
CR4	Diode, si, 75mA, 25V piv	241422	03508	1N4009	REF		C
CR4	Diode, si, sm/sig	348177	03508	DA2429	REF		D
CR5	Diode, si, 75mA, 25V piv	241422	03508	1N4009	REF		C
CR5	Diode, si, sm/sig	348177	03508	DA2429	REF		D
CR6	Diode, si, rectifier, 1 amp	343491	11711	1N4002	8	2	C
CR6	Diode, zener, 400 MW, 15V	246033	07910	1N965A	1	1	D
CR7	Diode, si, rectifier, 1 amp	343491	11711	1N4002	REF		C
CR8	Diode, zener, 15V, ±5%	352377	03877	SV4823	2	1	
CR9	Diode, si, rectifier, 2 amp, 50V	347559	14099	1N5400	4	1	
CR10	Diode, si, rectifier, 2 amp, 50V	347559	14099	1N5400	REF		
CR11	Diode, si, rectifier, 2 amp, 50V	347559	14099	1N5400	REF		
CR12	Diode, si, rectifier, 2 amp, 50V	347559	14099	1N5400	REF		
CR13	Diode, si, rectifier, 1 amp (8000A)	343491	11711	1N4002	REF		
CR13	Diode, si, 150mA (8000A–01)	203323	03508	DHD1105	6	2	C
CR13	Diode, si, rectifier, 1 amp (8000A–01)	343491	11711	1N4002	REF		D
CR14	Diode, si, rectifier, 1 amp (8000A)	343491	11711	1N4002	REF		
CR14	Diode, si, 150mA (8000A–01)	203323	03508	DHD1105	REF		C
CR14	Diode, si, rectifier, 1 amp (8000A -01)	343491	11711	1N4002	REF		D
CR15	Diode, si, rectifier, 1 amp (8000A)	343491	11711	1N4002	REF		
CR15	Diode, si, 150mA (8000A–01)	203323	03508	DHD1105	REF		
CR16	Diode, si, rectifier, 1 amp (8000A)	343491	11711	1N4002	REF		
CR16	Diode, si, 150mA (8000A–01)	203323	03508	DHD1105	REF		
CR17	Diode, si, rectifier, 1 amp (8000A)	343491	11711	1N4002	REF		
CR17	Diode, si, 150mA (8000A–01)	203323	03508	DHD1105	REF		
CR18	Diode, si, rectifier, 1 amp (8000A)	343491	11711	1N4002	REF		
CR18	Diode, si, 150mA (8000A–01)	203323	03508	DHD1105	REF		
CR19	Diode, zener, 15V ±5% (8000A)	352377	03877	SV4823	REF		
CR20	Part of matched set, see 1	———	——	———			
CR21	Diode, zener, 6.8V ±5% (8000A–01) (may not be included)	352898	89536	352898	1		
CR22	Diode, si, sm/sig	348177	03508	DA2429	REF		B
DS5	Lamp, GE63 (8000A–01)	352237	08806	63	1	1	
F1	Fuse, fast acting, 1/8 amp 250V (8000A)	196790	71400	TYPE AGC	1	5	
F1	Fuse, slo blo, 1/8 amp 250V (8000A–01)	166488	71400	TYPE MDL	1	5	
XF1	Fuse clip	284984	89536	284984	1		
XF2	Fuse contact	338665	89536	338665	1		
P1	Plug, power, 3 prong	———	——	———			
	Contact, voltage	338657	89536	338657	2		
	Contact, earth common	338640	89536	338640	1		
	Insulator, line contact (8000A)	338624	89536	338624	1		
	Insulator, line contact (8000A–01)	344184	89536	344184	1		
Q1	Xstr, FET, N-Channel	288324	15818	U2412	1	1	C
Q1	Xstr, FET, N-Channel	352112	15818	U2610E	1	1	D
Q2	Xstr, si, NPN	168716	07263	519254	2	1	
Q3	Xstr, si, NPN	168716	07263	519254	REF		
Q4	Not used						
Q5	Not used						

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REF DESIG OR ITEM NO.	DESCRIPTION	FLUKE STOCK NO.	MFG FED SPLY CDE	MFG PART NO. OR TYPE	TOT QTY	REC QTY	USE CDE
Q6	Xstr, si, PNP	288761	07933	RS2048	1	1	
Q7	Sxtr, si, NPN	218396	04713	2N3904	8	2	
Q8	Xstr, si, NPN	218376	04713	2N3904	REF		
Q9	Xstr, si, NPN	218396	04713	2N3904	REF		
Q10	Xstr, si, NPN	218396	04713	2N3904	REF		
Q11	Xstr, si, PNP	340026	04713	MPS6563	3	1	
Q12	Xstr, si, PNP	340026	04713	MPS6563	REF		
Q13	Xstr, si, PNP	340026	04713	MPS6563	REF		
Q14	Xstr, si, PNP	340026	04713	MPS6563	REF		
Q15	Xstr, si, NPN	218396	04713	2N3904	REF		
Q16	Xstr, si, NPN	218396	04713	2N3904	REF		
Q17	Xstr, si, NPN	218396	04713	2N3904	REF		
Q18	Xstr, si, NPN	218396	04713	2N3904	REF		
Q19	Xstr, si, PNP (8000A)	352369	04713	2N4403	1	1	
Q20	Xstr, si, NPN	352138	89536	352138	1	1	
Q21	Xstr, si, PNP	352146	89536	352146	1	1	
Q22	Xstr, si, NPN (8000A–01)	330803	07263	MPS6560	2	1	
Q23	Xstr, si, NPN (8000A–01)	330803	07263	MPS6560	REF		
Q24	Xstr, si, NPN	168708	03508	2N3391	1	1	
R1	Part of matched set, see 3	———	——	———			
R2	Part of matched set, see 3	———	——	———			
R3	Part of matched set, see 3	———	——	———			
R4	Res, comp, 100k +10%, 2W	158659	01121	HB1041	1		
R5	Res, comp, 680k ±5%, ¼W	188433	01121	CB6845	1		C
R5	Res, comp, 1M, ±5%, ¼W	182204	01121	CB1055	1		D
R6	Res, comp, 4.7M ±5%, ¼W	220046	01121	CB4755	1		
R7	Res, car dep, 1k +5%, ¼W	343426	TOYO	R251025	3		
R8	Res, car dep, 1k ±5%, ¼W	343426	TOYO	R251025	REF		

8000A DIGITAL MULTIMETER INSTRUCTION MANUAL

REF DESIG OR ITEM NO.	DESCRIPTION	FLUKE STOCK NO.	MFG FED SPLY CDE	MFG PART NO. OR TYPE	TOT QTY	REC QTY	USE CDE
R9	Res, comp, 10k, ±5%, ¼W	148106	01121	CB1035	1		
R10	Res, car dep, 470k ±5%, ¼W	342634	TOYO	R254715	3		
R11	Res, met flm, 10k ±1%, 1/8W	168260	91637	MFF1-81012F	1		
R12	Res, var, cermet, 500Ω ±10%, 1W	291120	71450	360S501A	1	1	
R15	Res, var, 50k ±30%, ¼W	358127	71450	X201503	1	1	
R16	Res, comp, 82k ±5%, ¼W	188458	01121	CB8235	1		
R17	Res, nickel flm, 1Ω ±5%, ¼W	357665	TOYO	R251005	1	1	
R18	Res, comp, 470k ±10%, 2W	110247	01121	CB4745	1		
R19	Res, fxd, car dep, 560k ±5%, 1/3W	342642	TOYO	R331-35645	1		
R20	Res, var, cermet, 20k +10%, ½W	291609	71450	360S203A	1	1	
R21	Res, comp, 22Ω ±5%, 2W (8000A–01)	352229	01121	HB2205	1		
R22	Res, comp, 330Ω ±5%, ¼W (8000A–01)	147967	01121	CB3315	1		
R23	Res, var, cermet, 100Ω ±10%, 1W	285130	71450	360S101A	1	1	
R24	Res, comp, 82Ω ±5%, ¼W (8000A -01)	149484	01121	CB8205	1		
R25	Res, var, cermet, 1k ±10%, ½W	285155	71450	3605102A	1	1	
R26	Res, comp, 150k ±5%, ¼W	182212	01121	CB1545	1		
R27	Not Used						
R28	Not used						
R29	Not used						
R30	Res, comp, 6.8k ±5%, ¼W (8000A -01) (May not be included)	148098	01121	CB6825	1		
R31	Not used						
R32	Res, comp, 2.2k ±10%, 1/8W	153965	01121	BB2228	1		B
R33	Res, car dep, 3.9k ±5%, ¼W	342600	TOYO	R253R925	3		
R34	Res, car dep, 3.9k ±5%, 1/3W	342600	TOYO	R331-33925	REF		
R35	Res, comp, 20k ±5%, ¼W	221614	01121	CB2035	1		
R36	Res, comp, 30k ±5%, ¼W	193417	01121	CB3035	1		

8000A DIGITAL MULTIMETER INSTRUCTION MANUAL

REF DESIG OR ITEM NO.	DESCRIPTION	FLUKE STOCK NO.	MFG FED SPLY CDE	MFG PART NO. OR TYPE	TOT QTY	REC QTY	USE CDE
R37, R38	Not Used						
R39	Res, car dep, 470Ω ±5%, 1/3W	343434	TOYO	R331-34745	1		
R40	Res, met flm, 499k +1%, 1/8W (8000A) (may not be included)	268813	91637	MFF1-84993F	1		
R40	Res, met flm, 215k ±1%, 1/8W (8000A -01) (may not be included)	289470	91637	MFF1-82153F	1		
R41	Res, car dep, 3.9k ±5%, ¼W	342600	TOYO	R253R925	REF		
R42	Res, car dep, 470k ±5%, ¼W	342634	TOYO	R254745	REF		
R43	Res, car dep, 470k ±5%, ¼W	342634	TOYO	R254745	REF		
R44	Res, ww, current shunt, 900Ω	312611	89536	312611	1		
R45	Res, ww, current shunt, 90Ω	352401	89536	352401	1		
R46	Res, ww, current shunt, 9Ω	352419	89536	352419	1		
R47	Res, ww, current shunt, 1Ω	352427	89536	352427	1		
R48	Res, ww, 0.1Ω ±0.1%, ½W	345579	89536	345579	1	1	
R49	Res, car dep, 1k ±5%, ¼W, (8000A)	343426	TOYO	R251025	REF		
R50	Res, met flm, 498Ω +0.1%, 1/8W	352252	91637	MFF1-84980 PORMOR1PCT	1		
R51	Res, met flm, 4.53k +0.1%, 1/8W	343467	91637	MFF1-84531 PORMOR1PCT	1		
R52	Res, met flm, 10.02k ±0.1%, 1/8W	352245	91637	MFF1-810R021 PORMOR1PCT	1		
R53	Part of matched set, see 2	---	--	---			
R54	Part of matched set, see 2	---	--	---			
R55	Res, var, cermet, 50Ω±10%, 1W	285122	71450	360550A	1	1	
R56	Part of matched set, see 1	---	--	---			
R57	Part of matched set, see 1	---	--	---			
R58	Part of matched set, see 1	---	--	---			
R59	Part of matched set, see 2	---	--	---			
R60	Res, met flm, 5.62k ±1%, 1/8W	235168	91637	MMF1-85621F	1		
R61	Res, comp, 47k ± 5%, ¼W	148163	01121	CB4735	1	F	
RN1	Resistor network, 8 pc.	344069	89536	344069	1	1	
RN2	Resistor network, 11 pc.	344077	89536	344077	1		

8000A DIGITAL MULTIMETER INSTRUCTION MANUAL

REF DESIG OR ITEM NO.	DESCRIPTION	FLUKE STOCK NO.	MFG FED SPLY CDE	MFG PART NO. OR TYPE	TOT QTY	REC QTY	USE CDE
S1 thru S12	Switch assembly, pushbutton	342915	89536	342915	1	1	
T1	Xformer, 115V (8000A and 8000A–02)	345629	89536	345629	1		
	Xformer, 230V (8000A and 8000A–02)	345629	89536	345629	1		
	Xformer, 115V (8000A–01)	345637	89536	345637	1		
	Xformer, 230V (8000A–01)	345637	89536	345637	1		
	Xformer, 100V (8000A and 8000A–02)	345645	89536	345645	1		
	Xformer, 100V (8000A 01)	345652	89536	345652	1		
T2	Xformer, inverter (8000A–01)	346049	89536	346049	1		
U1	I.C. Op. Amp. (AC Converter)	352930	89536	352930	1		
U2	I.C. Op. Amp. (Ohms Converter) see 2	---	--	---			
U3	Analog I.C. see 1	---	--	---			
U4	Digital I.C.	326017	89536	326017	1	1	G
U4	Digital I.C.	375154	89536	375154	1	1	H
U5	I.C. TTL, BCD to 7-Seg. (Decoder Driver)	340109	89536	340109	1	1	
XF2	Contact, fuseholder (used with J2/XF2)	338665	89536	338665	1		
	Contact, battery (8000A–01)	344200	89536	344200	8		
	Holder, battery (8000A–01)	346932	89536	346932	2		
	Post, connector, uninsulated	267500	89536	267500	3		
	Shield, AC Converter	338673	89536	338673	1		
	Socket, I.C., 16 pin, Dual-in-Line (U3, U4, U5)	351916	82305	1440P	3		
	Socket, Short, 10-Contact	347815	82305	1477	1		
	1 CR20, R56, R57, R58, and U3 are a matched set. For replacement, order ANALOG RESISTOR SET, STOCK NO. 345496.						
	2 CR3, R53, R54, R59, and U2 are a matched set. For replacement, order OHMS RESISTOR SET, STOCK NO. 345504						
	3 R1, R2, and R3 are a matched set. For replacement, order INPUT DIVIDER RESISTOR SET, STOCK NO. 306407.						

REF DESIG OR ITEM NO.	DESCRIPTION	FLUKE STOCK NO.	MFG FED SPLY CDE	MFG PART NO. OR TYPE	TOT QTY	REC QTY	USE CDE
	NOTE: If one or more components in a set require replacement, the entire set must be replaced.						
A2	FRONT PANEL ASSEMBLY	---	--	---			
F2	Fuse, fast acting, 2 amp	346940	89536	346940	1	5	
J1	Jack, banana, red	162065	74970	108902	1		
J2/XF2	Jack/Fuseholder, banana/barrel, red	345611	89536	345611	1		
J3	Jack, banana, black	162073	74970	108903	1		
	Lens, red	338616	89536	338616	1		
	Retainer, Neoprene Grommet	352484	89536	352484	2		
	Panel, front, molded (no decal)	330084	89536	330084	1		
	Decal, Front Panel	343756	89536	343756			
A3	DISPLAY ASSEMBLY	REF					
DS1	Diode, Light-emitting, alpha numeric, (± & 1) red	334581	29083	MAN101A	1	1	
DS2, DS3	Diode, Light-emitting, alpha numeric, (0-9) red	334573	29083	MAN10A	3	1	
	Printed Circuit, Display	338343	89536	338343	1		

DIGITAL PRINTER OUTPUT UNIT, OPTION –02

REF DESIG OR ITEM NO.	DESCRIPTION	FLUKE STOCK NO.	MFG FED SPLY CDE	MFG PART NO. OR TYPE	TOT QTY	REC QTY	USE CDE
	DIGITAL PRINTER OUTPUT UNIT, OPTION –02 (Figure 5-3)						
C1	Cap, cer, 500 pf ±10%, 500V	105692	71590	Type CE501	2		
C2	Cap, cer, 500pf ±10%, 500V	105692	71590	Type CE501	REF		
CR1	Diode, sil, 150mA	203323	07263	1N4148	4		
CR2	Diode, sil, 150mA	203323	07263	1N4148	REF		
CR3	Diode, sil, 150mA	203323	07263	1N4148	REF		
CR4	Diode, sil, 150mA	203323	07263	1N4148	REF		
P1	Connector, card edge, 20 contact	352310	NAT. CONN	A202389-04	1		
R1	Res, comp, 10k ±5%, ¼W	148106	01121	CB1035	3		
R2	Res, comp, 100k ±5%, ¼W	148189	01121	CB1045	2		
R3	Not used						
R4	Res, comp, 33k ±5%, ¼W	148155	01121	CB3335	1		
R5	Res, comp, 10k ±5%, ¼W	148106	01121	CB1035	REF		
R6	Res, comp, 100k ±5%, ¼W	148189	01121	CB1045	REF		
R7	Res, comp, 10k ±5%, ¼W	148106	01121	CB1035	REF		
RN1	Res, network, 7 res, 15k ±5%, ¼W	352054	56289	#760-3	4		
RN2	Res, network, 7 res, 15k ±5%, ¼W	352054	56289	#760-3	REF		
RN3	Res, network, 7 res, 15k ±5%, ¼W	352054	56289	#760-3	REF		
RN4	Res, network, 13 res, 15k ±5%, ¼W	352047	56289	#760-1	1		
RN5	Res, network, 7 res, 15k ±5%, ¼W	352054	56289	#760-3	REF		E
U1	I.C.,MOS, dual D flip-flop	340117	04713	MC14013L	1		
U2	I.C., MOS, dual 4-bit shift register	340125	04713	MC14015CL	2		
U3	E.C., MOS, dual 4-bit shift register	340125	04713	MC14015CL	REF		
U4	I.C., hex inverter	352039	12040	SN7404N	1		
U5, U6, U7	Not used						

DIGITAL PRINTER OUTPUT UNIT, OPTION –02

REF DESIG OR ITEM NO.	DESCRIPTION	FLUKE STOCK NO.	MFG FED SPLY CDE	MFG PART NO. OR TYPE	TOT QTY	REC QTY	USE CDE
U8	I.C., linear, 5 tstr., NPN sil	248906	95303	CA3046	4		
U9	I.C., linear, 5 tstr., NPN sil	248906	95303	CA3046	REF		
U10	I.C., linear, 5 tstr, NPN sil	248906	95303	CA3046	REF		
U11	I.C., linear, 5 tstr., NPN sil	248906	95303	CA3046	REF		
	Backshell, connector	357020	89536	357020	1		

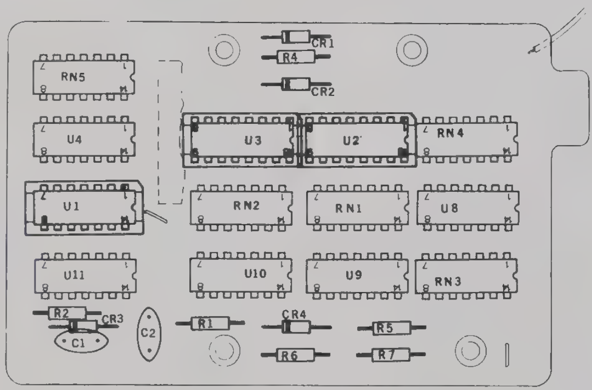


Figure 5-3. DPOU PCB ASSEMBLY, OPTION –02

Section 6

Accessory Information

6-1. INTRODUCTION

6-2. Several accessories are available for use with the Model 8000A. These accessories are listed in Table 1-1 of Section 1 in this instruction manual. This section describes each accessory and how it is used with the Model 8000A.

6-3. CARRYING CASE (C80)

6-4. The carrying case is illustrated in Figure 6-1. It is a soft vinyl case with carrying strap, fitted to the Model 8000A. A storage compartment is provided for test leads, power cord and other compact accessories.

6-5. FRONT PANEL DUST COVER (M00-100-714)

6-6. The molded plastic dust cover accessory snaps-on over the front panel of the Model 8000A. This cover affords protection to the front panel and controls.

6-7. RACK MOUNT KITS (M00-200-611/612)

6-8. Both rack mount kits provide full width panel mounts 3½ inches in height to fit standard 19 inch E.I.A. racks. One, -612, centers the Model 8000A in the full width panel. The other, -611, provides offset, left or right side, mounting of the instrument. Use the following procedure for installing the instrument into either rack mounting panel. Figure 6-2

illustrates assembly of the center mount panel. Assembly of the offset mount panel is identical.

a. Disassemble carrying handle from case by removing handle disc decals and mounting screws.

b. Remove instrument retaining screw at rear of case, and remove instrument from case.

c. Install side mounting brackets as shown in Figure 6-2, and secure to mounting panel with nuts provided.

d. Partially insert instrument case through mounting panel.

e. Install handle mounting screws through brackets into handle mounting bosses on case. Avoid stripping threads in handle mounting boss.

f. Re-install instrument into case, securing with retaining screw at rear of case.

Figure 6-1. C80, CARRYING CASE

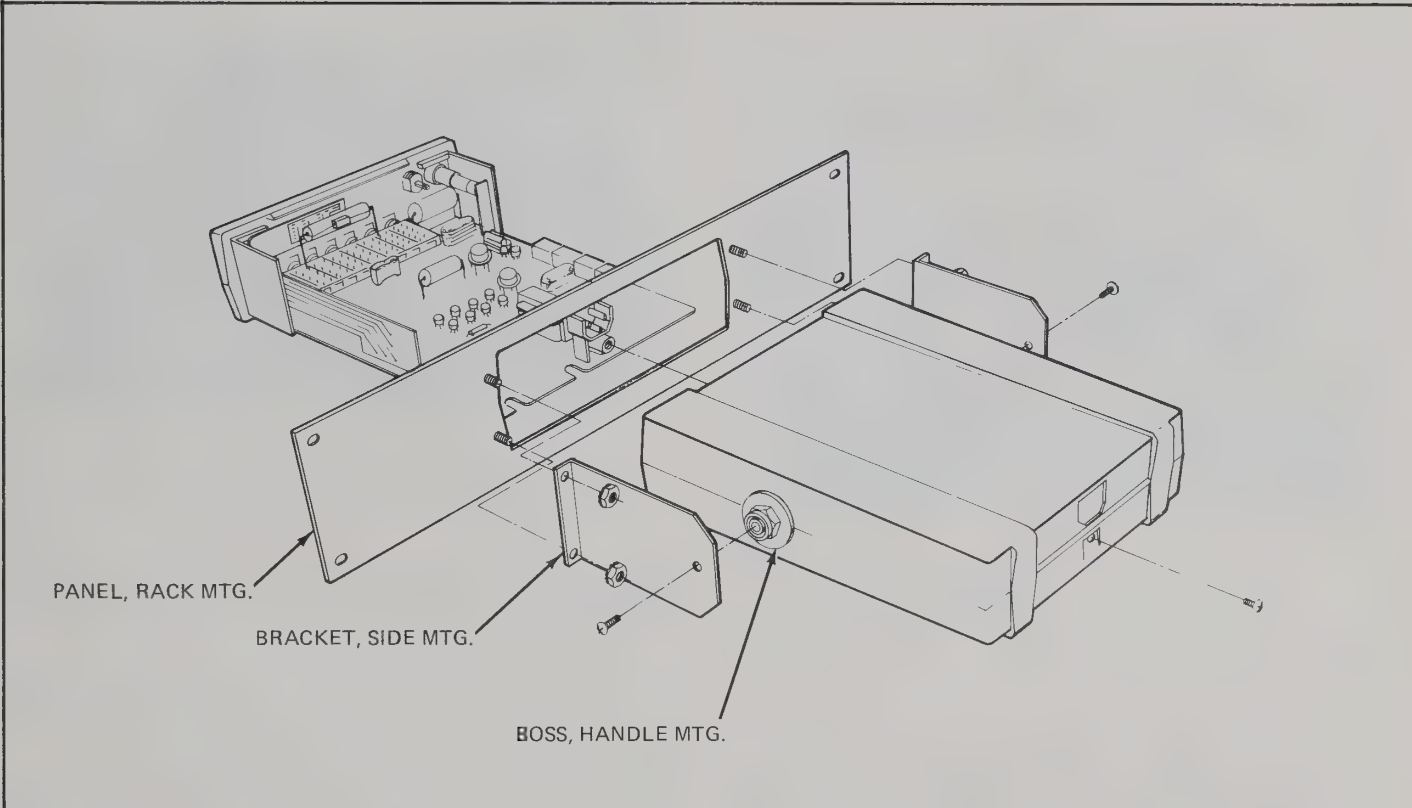


Figure 6-2. RACK MOUNTING ASSEMBLY

6-9. DELUXE TEST LEAD KIT (A80)

6-10. The test lead kit is shown in Figure 6-3. Kit contains two color coded test leads with threaded adapters. These adapters attach to banana plugs, pin tips, test prod tips, alligator clips, and binding post lugs included in kit.

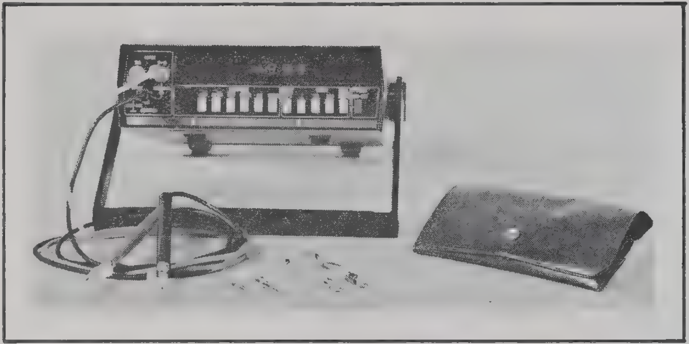


Figure 6-3. A80, DELUXE TEST LEAD KIT

6-11. CLAMP-ON AC HIGH CURRENT PROBE (80I-600)

6-12. Introduction

6-13. Figure 6-4 shows the High Current Probe. The 80I-600 extends the ac current measurement capability of the Model 8000A DMM. AC current measurements can be made from 2 to 600 amperes at up to 400 Hz with ±3% accuracy.

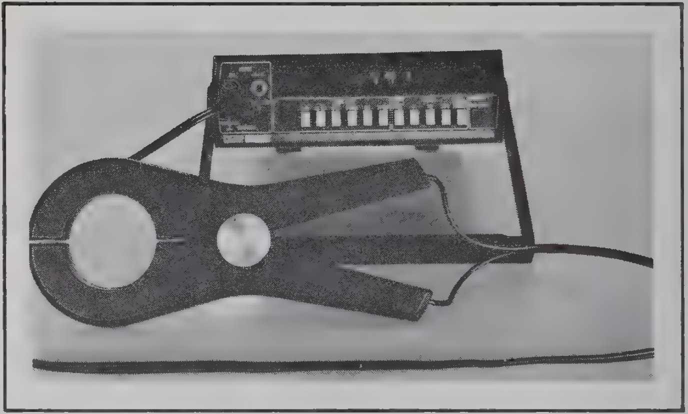


Figure 6-4. 80I-600, AC HIGH CURRENT PROBE

6-14. Operation

6-15. Use the following procedure for operating the 8000A DMM with the 80I-600 current probe.

a. Plug 80I-600 into MA and COMMON INPUT terminals on 8000A front panel.

b. Select AC MA FUNCTION pushbutton.

c. Select RANGE pushbutton in accordance with the following table. (The table accounts for the probe division ratio of 1000:1.)

Table 6-1. AC CURRENT PROBE

8000A RANGE PUSH-BUTTON	8000A CURRENT RANGE WITH PROBE	8000A READOUT RANGE WITH PROBE (Amperes)
2000 MA	200A to 600A	200. to 600.
200	20A to 200A	20.0 to 199.9
20	2A to 20A	2.00 to 19.99

d. Clamp probe around current carrying conductor to be measured. Observe readout on 8000A DMM in amperes.

NOTE!

Clamping probe around more than one current carrying conductor at a time produces a reading that is the vector sum of the currents in the conductors.

6-16. HIGH VOLTAGE PROBE (80K-30)

6-17. Introduction

6-18. Figure 6-5 shows the High Voltage Probe. The dc voltage range of the Model 8000A DMM can be extended to 30 kilovolts when used with the 80K-30 High Voltage Probe. Specifications for the high voltage probe are given below. A schematic diagram is shown in Figure 6-6.

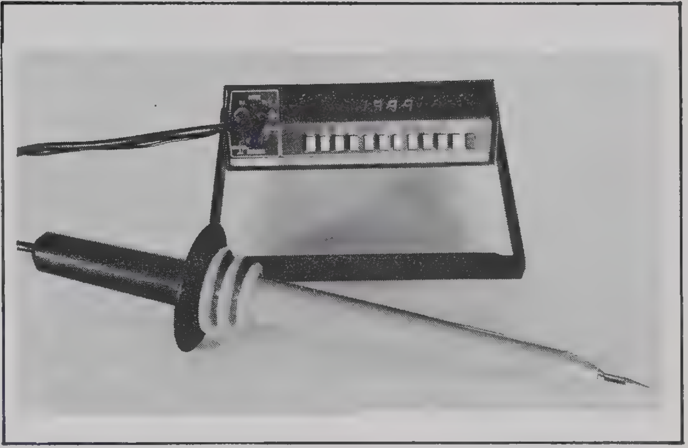


Figure 6-5. 80K-30, HIGH VOLTAGE PROBE

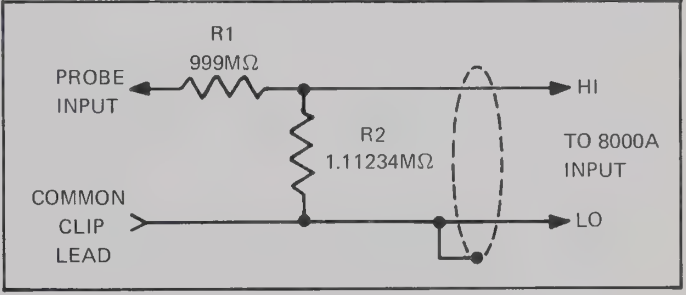


Figure 6-6. 80K-30 SCHEMATIC DIAGRAM

Voltage Range, 1 kV-30 kV
Input Resistance, 1000 MΩ
Division Ratio, 1000:1
Ratio Accuracy, ±1.0% @ 25 kV
Operating Temp. Range, 0 - 50°C
Humidity Range, 0 - 80 % RH
Cable Length, 5′ (1,5 meters)

NOTE!

(1) Calibrated for 10 MΩ voltmeter input resistance

(2) The overall accuracy specification from 20 kV to 30 kV is ±2%; this includes the total effects of ratio accuracy, voltage coefficient, temperature coefficient, long-term stability, power coefficient, and 8000A multimeter accuracy.

6-19. Operation

6-20. Use the following procedure for operating the Model 8000A DMM with the 80K-30 High Voltage Probe.

a. Plug high voltage probe cable assembly into the V–Ω and COMMON INPUT terminals on the 8000A front panel.

NOTE!

Ensure that plug associated with keyed side of dual banana plug is connected to COMMON terminal on 8000A.

b. Select DCV FUNCTION pushbutton.

c. Select RANGE pushbutton in accordance with Table 6-2. (The table accounts for the probe division ratio of 1000:1.)

Table 6-2. HIGH VOLTAGE PROBE.

8000A RANGE PUSHBUTTON	8000A DC VOLTAGE RANGE WITH PROBE	8000A READOUT RANGE WITH PROBE (Kilovolts)
200	20 kV to 30 kV	20.0 to 30.0
20	2 kV to 20 kV	2.00 to 19.99
2	1 kV to 2 kV	1.000 to 1.999

d. With common lead connected to suitable ground, connect probe to point to be measured. Observe readout on 8000A DMM in kilovolts.

CAUTION!

Always connect common lead to ground before touching high voltage probe to high voltage source. Failure to do so may result in damage to instrument.

6-21. HIGH FREQUENCY PROBE (80RF-1)

6-22. Introduction

6-23. The Model 80RF-1 High Frequency Probe, Figure 6-7, allows measurements over a frequency range of 100 kHz to 500 MHz from

0.25 to 30 volts when using FLUKE voltmeters having an input impedance of 10 megohms ±10%. The accuracy of measurement is ±5% from 100 kHz to 100 MHz and +7% to 500 MHz. The probe operates into any dc voltmeter having an input impedance of 10 megohms ±10%. A shielded dual-banana plug on the probe permits direct connection to the voltmeter input, an adapter is provided for connection to the 8000A.

Figure 6-7. 80RF–1, HIGH FREQUENCY PROBE

6-24. Specifications

6-25. ELECTRICAL

Voltage: 0.25V to 30V

Response: Responds to peak value of input. Calibrated to read rms value of a sine wave input.

AC to DC Transfer Accuracy: Loaded with 10 megohms ±10%.

	100 KHz–100 MHz	100 MHz–500 MHz
+10°C to +30°C	±5%	±7%
–10°C to +40°C	±7%	±15%

< ±3 db at 10 kHz and 700 MHz

Input Impedance: 4 megohms shunted by 2 ±0.5 pf.

Maximum Input: 30 volts rms AC, 200 volts DC.

6-26. GENERAL

Cable Connections: Shielded dual banana plug fits all standard 3/4-inch dual banana connectors.

Cable Length: 4 ft. (121,9 cm) minimum.

Weight: 3½ oz. net.

Accessories: Ground Lead, Straight Tip, Hook Tip, High Frequency Adapter

6-27. Operation

6-28. Connect the shielded dual banana plug directly to the voltmeter input terminals, GND to COMMON or LO. Affix the appropriate probe tip to the probe body, then connect the probe to the high frequency circuit under test. When using the Straight or Hook Tip the ground clip must be connected to the test circuit. When using the high frequency adapter with appropriate 50 ohm connectors, the ground clip is not required.

6-29. The Straight Tip or Hook Tip supplied with the probe can be used for measurements up to 100 MHz. For measurements above 100 MHz the High Frequency Adapter allows connections to 50 ohm terminations. Ensure that the probe is used in conjunction with dc voltmeters having 10 MΩ ±10% input impedance to meet its specifications.

6-30. The maximum input to the probe is 30 volts rms ac, or 200 volts dc. These factors may be used in combination so that an ac signal may be measured riding on a dc voltage of up to 200 volts. However, it must be noted that if ac superimposed on dc is being measured, the dc level must not be changed by more than 200 volts or the resulting transient is apt to damage the diodes inside the probe.

6-31. Theory of Operation

6-32. Figure 6-8 contains a schematic diagram of the probe. C1 is a dc blocking capacitor, CR1 is used as a detector, and R1, R3, CR2, R2, and Rin form a divider network. C1, charging through CR1 during the negative half cycle of the input produces a positive dc voltage at the CR1-R1 junction which equals the negative peak value of the input signal. The divider network reduces this to the rms value of the input. It can be seen that the probe must be operated into a 10 MΩ load in order to maintain the proper division ratio.

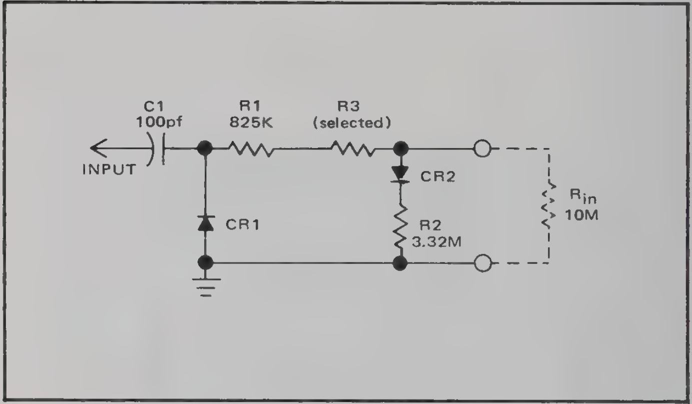


Figure 6-8. 80RF-1 SCHEMATIC

6-33. CR2 provides compensation for the non-linearity of the detector. R3 is a selected part having a value of 50 kΩ to 100 kΩ, as required for proper divider action.

6-34. Maintenance

6-35. PERFORMANCE CHECKS

6-36. The following checks verify the probe AC to DC Transfer accuracy.

6-37. Low Frequency Response

6-38. Connect equipment as shown in Figure 6-9 , and perform the following steps.

a. With equipment as shown in connection "A" adjust the ac signal source for an output of 3.000 volts rms at 100 kHz as measured on the DVM.

b. In connection "B" with the DVM set to measure dc, observe a probe output of 3.15 to 2.85 volts.

c. Placing cables back in connection "A", decrease the ac signal source by 10 db (0.95 volts).

d. Moving back to connection "B", observe a voltmeter indication of between 1.00 and 0.90 volts (10 db down from 3 volts).

e. In connection "A", decrease the ac signal source an additional 10 db (to 0.3 volts) as indicated by the voltmeter in its ac function.

f. Back to "B", observe a voltmeter reading of .315 to .285 Vdc.

g. Return the ac signal source back to 3.000 Vrms.

h. Repeat steps a through g with frequencies of 500 kHz, 1 MHz, and 10 MHz.

6-39. High Frequency Response

6-40. Connect equipment to the 80-RF probe as shown in Figure 6-10, and perform the following steps:

a. Set the ac signal source to 100 MHz with an output level of 10 milliwatts as indicated on the power meter. Ensure that the ac signal source has stabilized at 10 millivolts output.

b. Observe that the voltmeter indication is between 0.757 and 0.657 volts. (0.707 volts corresponds to 10 milliwatts in 50 ohms.)

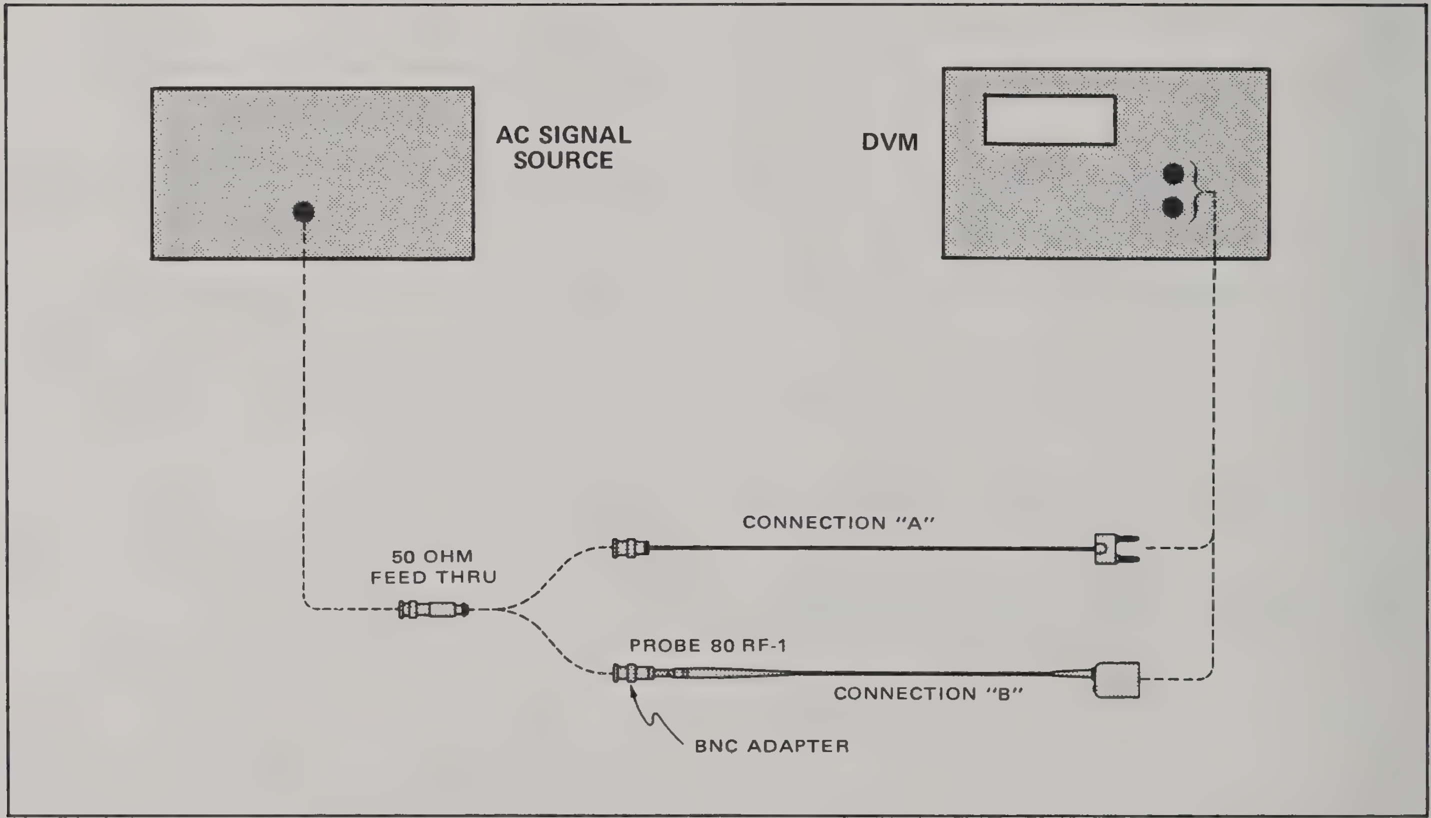
c. Repeat the above for frequencies fo 200 MHz, 300 MHz, 400 MHz, and 480 MHz.

6-41. CALIBRATION

6-42. Should the 80-RF require recalibration, perform the following steps:

a. Perform steps a and b in paragraph 6-37, with a frequency of 1 MHz.

b. Observe the dc voltmeter indication; a reading below 3 volts calls for a decrease in the value of R3, a reading above 3 volts calls for an increase in R3. Resistor R3 should be a 1/8W metal film type. In a probe that is working properly, a 30 kΩ change in R3 will produce about a 1% reading deviation.



Figuer 6-9.   LOW FREQUENCY RESPONSE CHECK

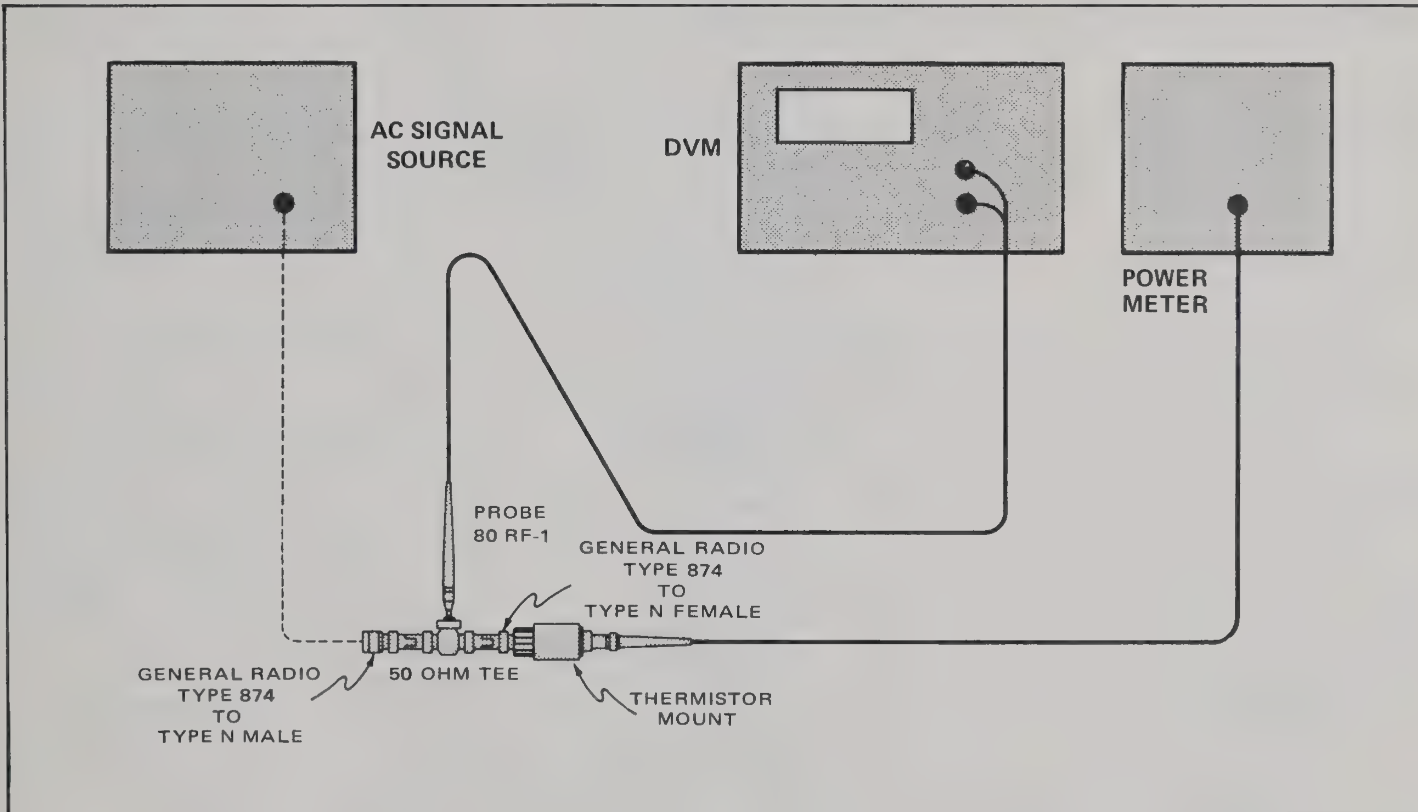


Figure 6-10. HIGH FREQUENCY RESPONSE CHECK

APPENDIX A – FEDERAL SUPPLY CODE FOR MANUFACTURES

A-1. CODE TO NAME

A-2. The following five digit code numbers are listed in numerical sequence along with the manufacturer's name and address to which the code has been assigned. The Federal Supply Code has been taken from Cataloging Handbook H 4-2, Code to Name.

01121 Allen-Bradley Co.
Milwaukee, Wisconsin

01281 TRW Semiconductors
Lawndale, California

02799 Arco Capacitors, Inc.
Torrence California

03508 General Electric Co.
Semiconductor Products
Syracuse, New York

03877 Transitron Electronic Corp.
Wakefield, Massachusetts

04713 Motorola Semiconductor
Products Inc.
Phoenix Arizona

06001 General Electric Co.
Capacitor Department
Irmo South Carolina

07263 Fairchild Semiconductor
Div. of Fairchild Camera
& Instrument Corp.
Mountain View, California

07910 Teledyne Corp.
(Continental Device)
Hawthorne, California

07933 Raytheon Co.
Mountain View, California

08806 General Electric Co.
Miniature Lamp Dept.
Cleveland, Ohio

11711 General Instrument Corp.
Newark New Jersey

12040 National Semiconductor Corp.
Danburry, Connecticut

12954 Dickson Electronics Corp.
Scottsdale, Arizona

13934 Midwec Corp.
Oshkosh, Nebraska

14099 Semtech Corp.
Newbury Park, California

14655 Cornell-Dubilier Electronics
Newark, New Jersey

15818 Amelco Semiconductor
Div. of Teledyne Inc.
Mountain View, California

17856 Siliconix, Inc.
Sunnyvale, California

29083 Monsanto, Co., Inc.
Santa Clara, California

56289 Sprague Electric Co.
North Adams, Massachusetts

71400 Bussmann Mfg.
Div. of McGraw–Elison Co.
Saint Louis, Missouri

71450 CTS Corp.
Elkhart, Indiana

71590 Centralab
Div. of Globe Union Inc.
Milwaukee, Wisconsin

72982 Erie Tech. Products Inc.
Erie, Pennsylvania

73445 Amperex Electronic Corp.
Hicksville, New York

73899 JFD Electronics Co.
Brooklyn, New York

74970 Johnson, E.F., Co.
Waseca, Minnesota

80031 Mepco
Div. of Sessions Clock Co.
Morristown, New Jersey

82305 Palmer Electronics Corp.
South Gate, California

89536 Fluke, John Mfg. Co., Inc.
Seattle, Washington

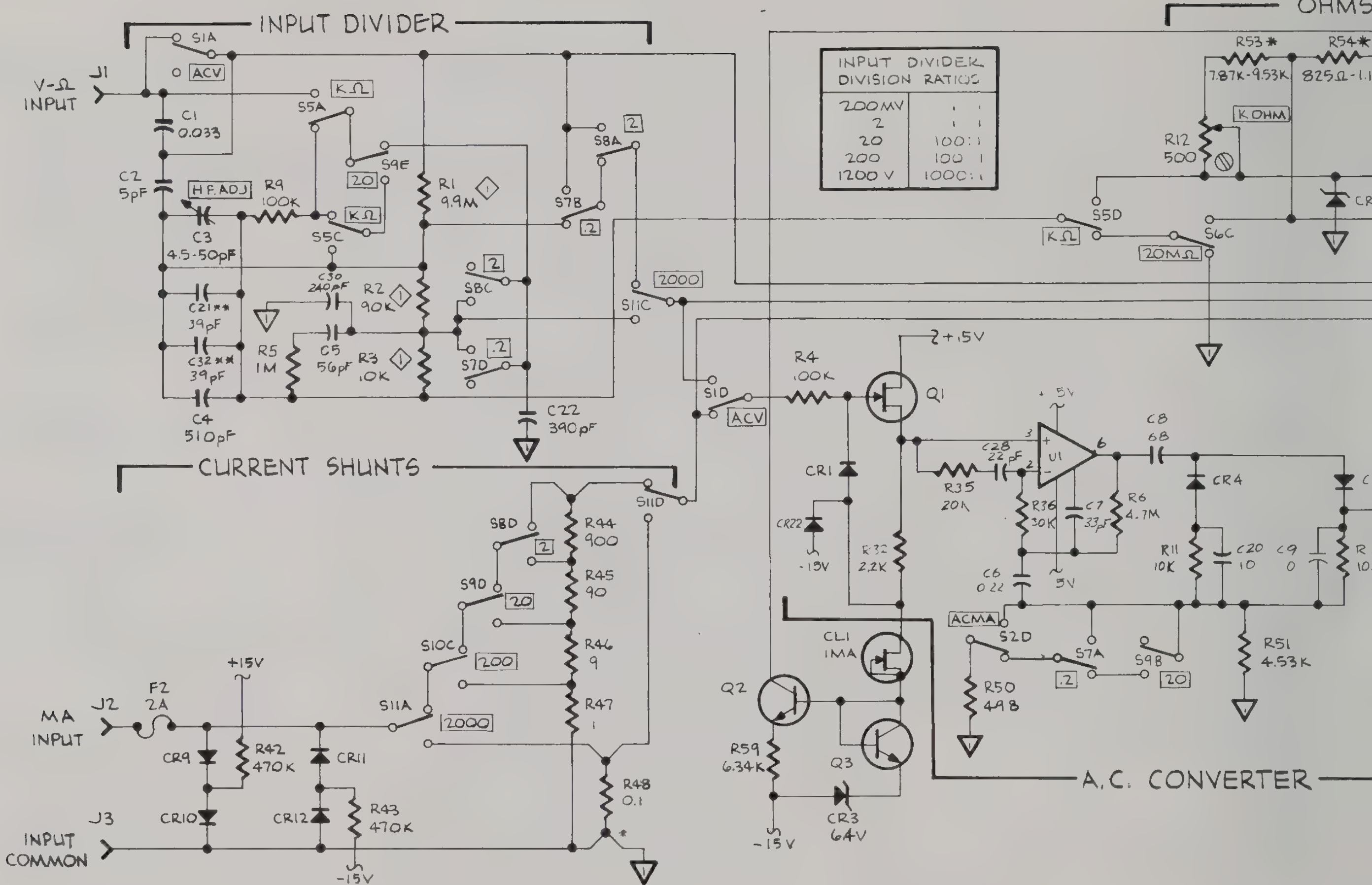
91637 Dale Electronics Inc.
Columbus, Nebraska

95303 Radio Corp. of America
Solid State & Receiving
Tube Div.
Cincinnati, Ohio

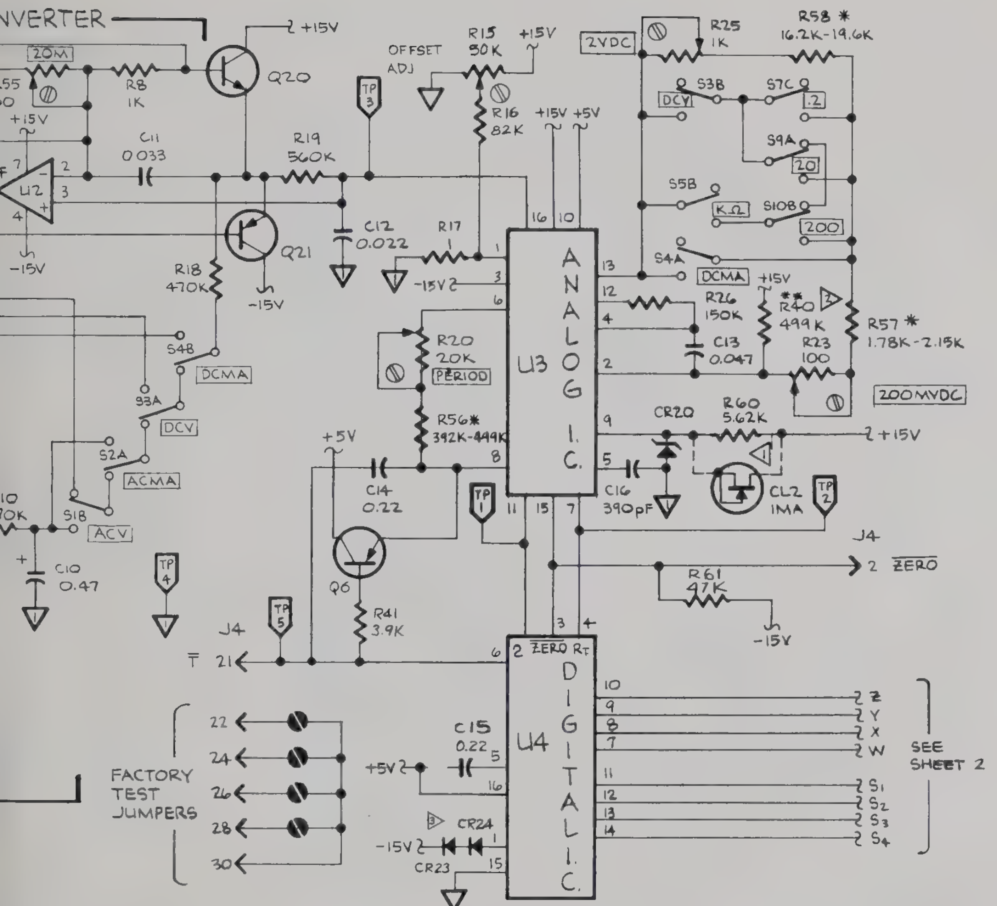
99392 STM Corp.
Oakland, California

Toyo Electronics
R–Ohm Corp.
Irvine, California

National Connector
Minneapolis, Minnesota

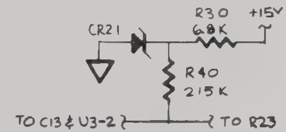


INPUT DIVIDER
OHMS
INPUT DIVIDER DIVISION RATIOS
200MV 1:1
2 1:1
20 100:1
200 100:1
1200 V 1000:1
V-Ω INPUT
J1
S1A
ACV
C1 0.033
C2 5pF
H.F. ADJ
C3 4.5-50pF
R9 100K
S5A
KΩ
S9E
20
S5C
R1 9.9M
S7B
S8A
2
.2
C30 240pF
R2 90K
C21** 39pF
C32** 39pF
R5 1M
C5 56pF
R3 10K
S8C
S7D
S11C
2000
C4 510pF
C22 390pF
S1D
R4 100K
Q1
+15V
R53* 7.87K-9.53K
R54* 825Ω-1.1
K OHM
R12 500
S5D
S6C
20MΩ
CURRENT SHUNTS
S11D
S8D
R44 900
R45 90
S9D
R46 9
S10C
200
R47 1
S11A
MA INPUT
J2
F2 2A
+15V
CR9
R42 470K
CR11
CR10
CR12
R43 470K
J3
INPUT COMMON
-15V
R48 0.1
CR1
CR22
-15V
R32 2.2K
U1
+5V
C28 22pF
R35 20K
R36 30K
C7 33pF
R6 4.7M
C8 68
CR4
C6 0.22
5V
R11 10K
C20 10
C9 0
ACMA
S2D
S7A
S9B
R51 4.53K
R50 49.8
CL1 1MA
Q2
Q3
R59 6.34K
CR3 6.4V
A.C. CONVERTER



NOTES:

1. ALL CAPACITANCE IN MICROFARADS AND ALL RESISTANCE IN OHMS UNLESS OTHERWISE NOTED.
2. * FACTORY SELECTED PART(S).
3. ALL SWITCHES SHOWN IN NON-DEPRESSED POSITION.
4. SUPPLY COMMON.
   SIGNAL COMMON.
5. J4 - BOARD EDGE CONNECTOR.
6. PCB JUMPER
7. INTERNAL ADJUSTMENT
8. 1 RESISTOR USED IN LINE POWERED INSTRUMENTS. CURRENT REGULATOR USED IN BATTERY POWERED INSTRUMENTS.
9. ** COMPONENT MAY NOT BE INSTALLED.
10. 3 CR23 AND CR24 USED ONLY IN 8000A-01
11. 1 MATCHED SET
12. 2 CONFIGURATION SHOWN FOR 8000A AND 8000A-02. 8000A-01 AS SHOWN BELOW:

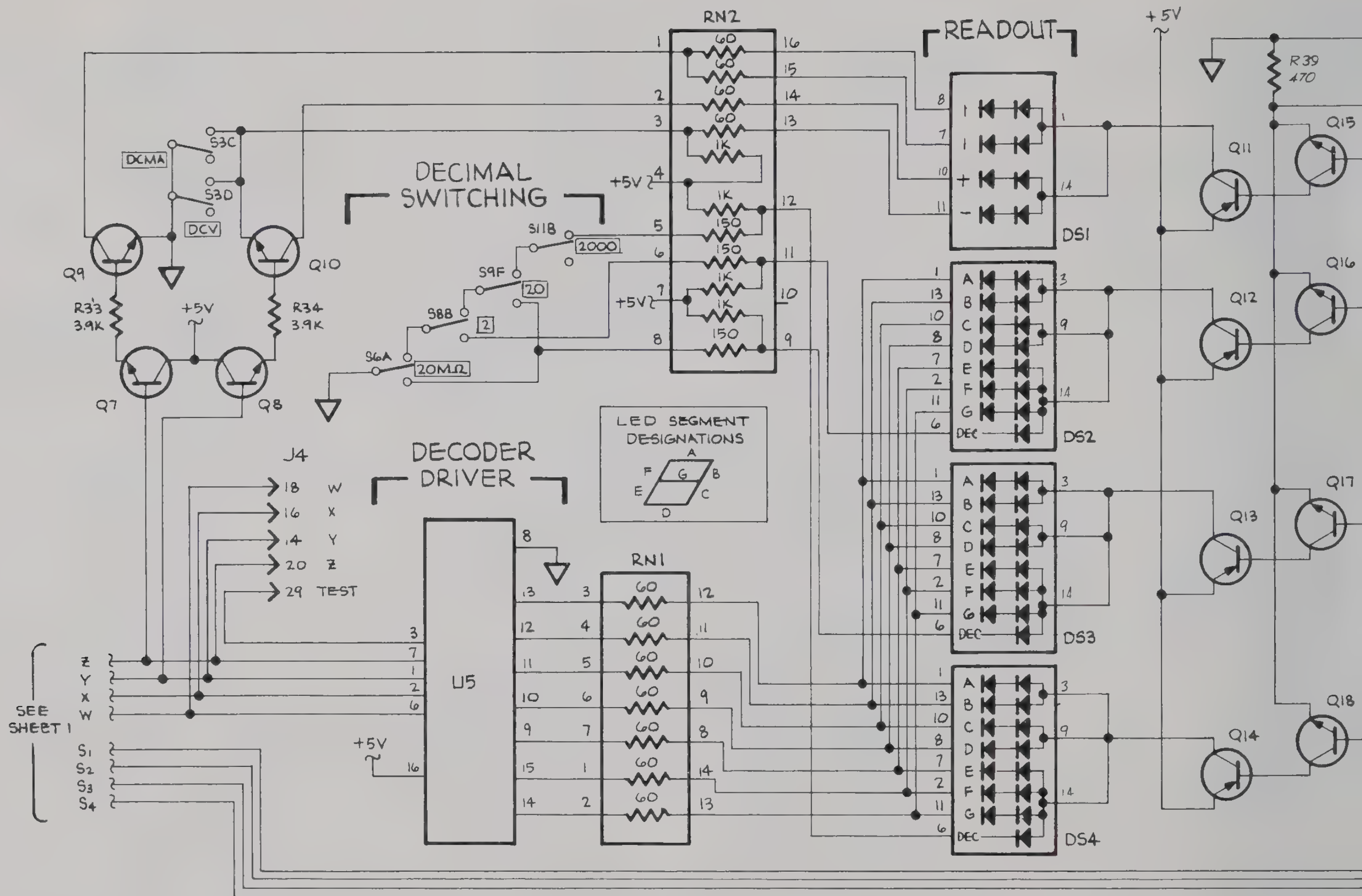


REV	DISCRIPTION
5	CHNG: U2-7, +17V TO +15V
4	ADD: R61; DLT: Q25, R13 & R14
3	ADD: C30, C31, C32, C28, R15, R16, R17, R32, R35, R36, CR22; CHG: C4, R5, DLT: CR2, C27
2	ADD: C23, R40, NOTE 13; CHG C6, C15
1	INITIAL ISSUE

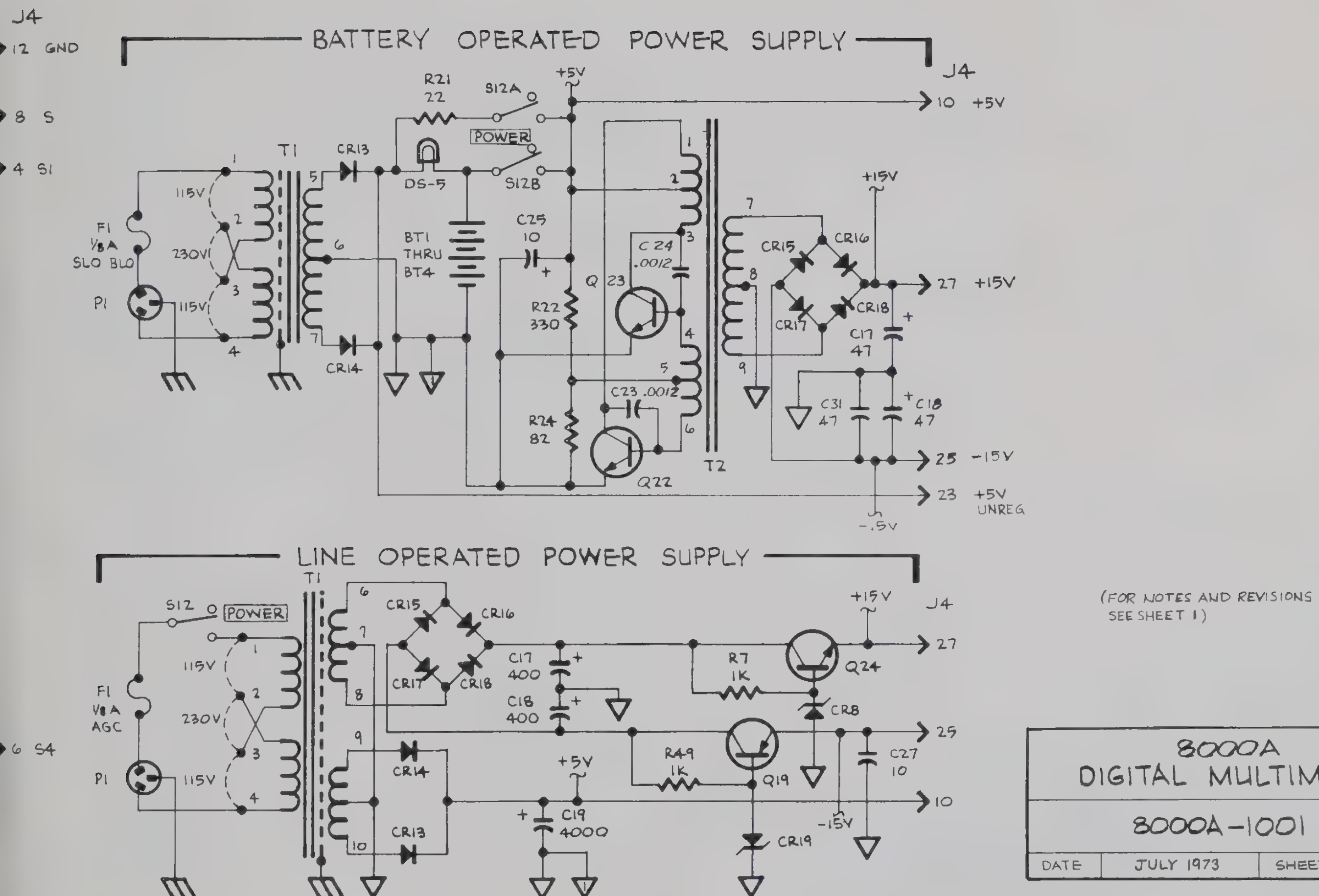
8000A
DIGITAL MULTIMETER

8000A-1001

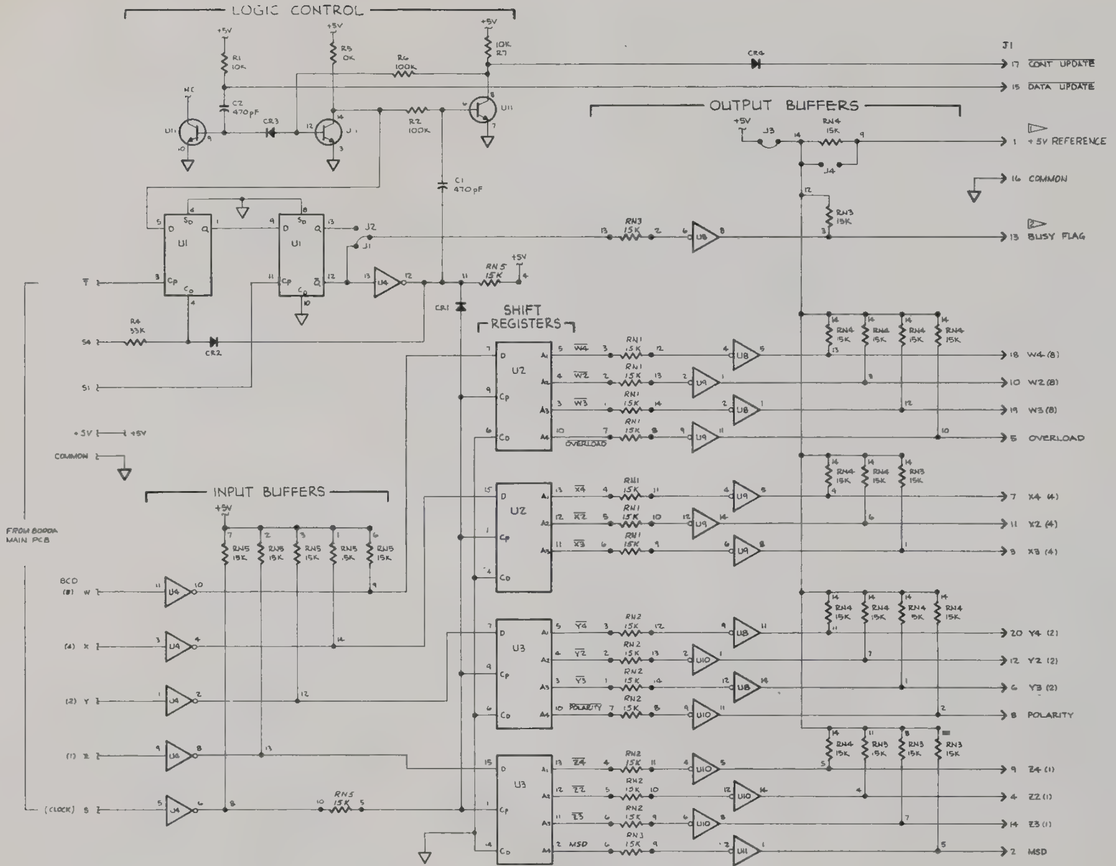
DATE	AUG. 1973	SHEET 1 OF 2



RN2
READOUT
+5V
R39
470
Q15
Q11
Q16
Q12
Q17
Q13
Q18
Q14
DS1
DS2
DS3
DS4
DECIMAL
SWITCHING
S3C
S3D
DCMA
DCV
S11B
2000
S9F
20
S8B
2
S6A
20MΩ
Q9
Q10
R33
3.9K
R34
3.9K
Q7
Q8
LED SEGMENT
DESIGNATIONS
J4
18 W
16 X
14 Y
20 Z
29 TEST
DECODER
DRIVER
U5
RN1
SEE
SHEET 1
DEC



8000A DIGITAL MULTIMETER		
8000A-1001		
DATE	JULY 1973	SHEET 2 OF 2



NOTES:

1. ALL RESISTANCE IS IN OHMS AND ALL CAPACITANCE IS IN MICROFARADS UNLESS OTHERWISE NOTED.

2.

DIG. \ BCD	8	4	2	1
2ND	W2	X2	Y2	Z2
3RD	W3	X3	Y3	Z3
4TH	W4	X4	Y4	Z4

3. MODIFIABLE FOR CONNECTION OF EXTERNAL PULL-UP VOLTAGE SEE INSTRUCTION MANUAL, SECTION 4

4. MODIFIABLE TO READY FLAG. SEE INSTRUCTION MANUAL, SECTION 4.

8000A-02, DPOU		
8000A-1012		
DATE	JULY 1973	SHEET 1 OF 1

Notes

Notes

SALES REPRESENTATIVES

U.S. & CANADA

Albuquerque, NM	(505) 299-7658
Atlanta, GA	(404) 874-9925
Boston, MA	(617) 861-8620
Chicago, IL	(312) 298-3600
Cleveland, OH	(216) 267-0445
Dallas, TX	(214) 231-2573
Dayton, OH	(513) 434-7500
Detroit, MI	(313) 892-2500
Glastonbury, CT	(203) 633-0777
Greensboro, NC	(919) 273-1918
Honolulu, HI	(808) 533-6095
Houston, TX	(713) 621-0040
Huntsville, AL	(205) 881-6220
Indianapolis, IN	(317) 244-2456
Jersey City, NJ	(201) 687-8737
St. Louis, MO	(314) 423-1234
Los Angeles, CA	(213) 245-9404
Minneapolis, MN	(612) 884-4336
Orlando, FL	(305) 896-4881
Philadelphia, PA	(215) 248-5050
Pittsburgh, PA	(412) 892-2953
Pleasantville, NY	(914) 769-1811
Phoenix, AZ	(602) 947-7841
Rochester, NY	(716) 266-1400
San Diego, CA	(714) 565-2555
Santa Clara, CA	(408) 244-1505
Seattle, WA	(206) 774-2211
Seattle, WA	(206) 624-9020
Washington, D.C.	(301) 881-5300
Williamsburg, VA	(703) 245-1786
Montreal, P.Q.	(514) 670-1212
Ottawa, ONT	(613) 829-9651
Toronto, ONT	(416) 678-1500
Vancouver, BC	(604) 253-7136

INTERNATIONAL (SALES & SERVICE)

ARGENTINA
Coasin S.A. 523185
Buenos Aires, Argentina

AUSTRIA
Kontron GmbH & Co. KG . .420202
Vienna, Austria

AUSTRALIA
Elmeasco Instruments Pty Ltd .9397944
Brookvale, Australia

BELGIUM
C.N. Rood S.A. 352135
Brussels, Belgium

BRAZIL
Ambriex S.A. 2647406
Rio de Janeiro, Brazil

CHILE
Coasin Chile Ltd. 396713
Santiago, Chile

CHINA, Peoples Republic of
May Lee Industries, Inc.
New York, N.Y. 10016

COLOMBIA
Marones Ltda. 364731
Bogota, Colombia

DENMARK
Tage Olsen A/S 294800
Copenhagen, Denmark

ECUADOR
Coasin Cia., Ltda. 526759
Quito, Ecuador

EASTERN EUROPE
Kontron GmbH & Co. KG . .420202
Vienna, Austria

FINLAND
Oy Findip AB 717799
Helsinki, Finland

FRANCE
M.B. Electronique 7723108
Paris, France

WEST GERMANY
Fey Elektronische Messgerate .184041
Munchen, West Germany

GREECE
Marios Dalleggio Representations
Athens, Greece 710669

HONG KONG & MACAU
Gilman & Co., Ltd. 227011
Hong Kong

INDIA
Hinditron Services Pvt. Ltd. .365344
Bombay, India

IRAN
Berkeh Company Ltd. . . 628294
Tehran, Iran

ISRAEL
R.D.T. Electronics Engineering Ltd.
Tel Aviv, Israel 4527831

ITALY
Sistral S.P.A. 5001860
Rome, Italy

JAPAN
Toyo Trading Company, Ltd. .2790771
Tokyo, Japan

KOREA
Asia Science & Co. 241431
International Box 1250
Seoul, Korea

MALAYSIA
O'Connor's (Pte) Ltd.
Petaling Jaya, West Malaysia

MEXICO
Mexitek, S.A. 5360910
Mexico D.F. Mexico

NETHERLANDS
C.N. Rood B.V. 996360
Rijswijk, Netherlands

NEW ZEALAND
David J Reid (N.Z.) Ltd.
Auckland, New Zealand

NIGERIA
Deemtee Electrontechnics Ltd.
Lagos, Nigeria

NORWAY
Morgenstierne & Co. A/S . .372940
Oslo, Norway

PAKISTAN
Pak International Operations
Karachi, Pakistan

PERU
Importaciones y Representaciones
Electronicas S.A.
Lima, Peru

PORTUGAL
Equipamentos De Laboratorio, Lda.
Lisbon, Portugal 535051

SINGAPORE
O'Connor's (Pte) Ltd. . . .637944
Singapore, Singapore

SOUTH AFRICA
K. Baker Associates Pty. Ltd .421939
Johannesburg, Republic of South Africa

SPAIN
Ataio Ingenieros S.A. . . .2153543
Madrid, Spain

SWEDEN
Teleinstrument AB 08380370
Stockholm, Sweden

SWITZERLAND
Kontron Electronic AG . . 01-628282
Zurich, Switzerland

TAIWAN
Heighten Trading Company, Ltd. 518324
Taipei, Taiwan, Republic of China

THAILAND
G. Simon Radio Ltd. 30991-3
Bangkok, Thailand

UNITED KINGDOM
Fluke International Corporation
Watford, England 33066

USSR
Codevintec Pacific Inc.
Woodland Hills, Calif. 91364

URUGUAY
Coasin Uruguaya S.A.
Montevideo, Uruguay

VENEZUELA
Coasin C.A. 722311
Caracas, Venezuela

JANUARY, 1974
PART NO. 347906
LITHO, IN U.S.A.


FLUKE
8000A
digital multimeter
MFG. CO., INC. P.O. BOX 7428 SEATTLE, WASH 98133
INPUT
MA
V-Ω
2A FUSE
2V MAX
1200V MAX
COMMON
+1.999
FUNCTION
ACV
AC MA
DCV
DC MA
KΩ
20MΩ
POWER
ON-OFF

WARRANTY

Fluke guarantees that any model of the 8000A will meet the specifications published herein throughout one full year from the date you receive it. Further, any part which fails during that time will be replaced and the instrument recalibrated without charge.

FACTORY AUTHORIZED SERVICE CENTERS

ARIZONA

PHOENIX

Arizona Standards Laboratory
4428 N. 19th Avenue
Phoenix, AZ 85000
Tel. (602) 264-9351

CALIFORNIA

LOS ANGELES

■ **Fluke Western Technical Center**
1109 So. Central Avenue
Glendale, CA 91204
Tel. (213) 245-6716
Twx. 910-497-2086
Contact Mr. Don McCook

SAN FRANCISCO

Instrument Specialists, Inc.
2359 De La Cruz Blvd.
Santa Clara, CA 95050
Tel. (408) 244-1505
Twx. 910-338-0121
Contact Mr. Tom Tierney

COLORADO

DENVER

Ball Bros. Research Corp.
P.O. Box 1062
Standardization Laboratory
Denver, Co. 80201
Tel. (303) 441-4786
Twx. 910-940-3241
Contact Mr. Jim Leaney

FLORIDA

ORLANDO

■ **Fluke Southeastern Technical Center**
P.O. Box 6578
940 N. Fern Creek Avenue
Orlando, FL 32803
Tel. (305) 843-6740
Twx. 810-850-0185
Contact Mr. Jesse Morse

HAWAII

HONOLULU

Industrial Electronics
P.O. Box 135
646 Queen Street
Honolulu, HI 96800
Tel. (808) 506-6095
Twx. 63238

ILLINOIS

CHICAGO

■ **Fluke Midwestern Technical Center**
9501 West Devon Avenue
Rosemont, IL 60018
Tel. (312) 825-1144
Twx. 910-253-1820
Contact Mr. Bruce Hunt

MARYLAND

KENSINGTON

Electronic Marketing Associates
11501 Huff Court
Kensington, MD 20795
Tel. (301) 881-5300
Twx. 710-825-9645
Contact Mr. John Hines

MASSACHUSETTS

ARLINGTON

Instrument Representatives, Inc.
1046 Massachusetts Avenue
Arlington, MA 02174
Tel. (617) 646-1034
Contact Mr. Dick Zemba

NEW JERSEY

SADDLEBROOK

Sirvess, Inc.
50 Market Street
Saddlebrook, NJ 07662
Tel. (201) 843-6051
Contact Mr. Vic Nafz

NEW MEXICO

ALBUQUERQUE

Missouri Research Labs
630 Haines N.W.
Albuquerque, NM 87107
Tel. (505) 243-6772
Contact Mr. Levi Martinez

NEW YORK

ROCHESTER

Service Engineers, Inc.
28 Finney Street
Rochester, NY 14605
Tel. (716) 232-2800
Contact Mr. Larry Flood

OHIO

CLEVELAND

Honeywell Metrology Service
4501 W. 160th
Cleveland, OH 44135
Tel. (216) 433-4810
Contact Mr. Tony Martinich

DAYTON

Honeywell Metrology Service
598 East Dayton Drive
Fairborn, OH 45324
Tel. (523) 878-2551
Contact Mr. Woody Winkhart

TEXAS

DALLAS

Tucker Electronics Company
1717 S. Jupiter Road
P.O. Box 22512
Garland, TX 75040
Tel. (214) 348-8800

HOUSTON

Linear Standards Laboratory, Inc.
8207 Millet
Houston, TX 77012
Tel. (713) 923-2796

UTAH

SALT LAKE CITY

Stabro Laboratories, Inc.
25 Kensington Avenue
Salt Lake City, UT 84115
Tel. (801) 467-8011

CANADA

TORONTO

Allen Crawford Associates Ltd.
6427 Northam Drive
Mississauga, Ontario
Tel. (416) 678-1500
Twx. 610-492-2119
Contact Mr. Herb Duval

FLUKE

CERTIFICATE of CALIBRATION

MODEL 8000A

The John Fluke Mfg. Co., Inc. does hereby certify the above listed instrument meets or exceeds all published specifications and has been calibrated using standards whose accuracies are traceable to the National Bureau of Standards within the limitations of the Bureau's calibration services, or have been derived from accepted values of natural physical constants, or have been derived by the ratio type of self-calibration techniques.

METROLOGY SYSTEMS

SEAL OF CERTIFIED CALIBRATION

William V. Fetrow

STANDARDS ENGINEER

MANAGER QUALITY ASSURANCE

Form No: A662—9/72

lara, CA 95050

Twx 910-338-0121

COLORADO

Twx 910-933-3241

Contact Mr. Jim Leatley

Industrial Electronics

Contact Mr. B... Hunt

Contact Mr. Nick Zamba

NEW JERSEY

50 Market Street

Tel. (201) 843-6051

Albuquerque, NM 87107

Tel. (505) 243-6770

Contact Mr. Levi Martinez

Postage
Will Be Paid
by
Addressee

No
Postage Stamp
Necessary
If Mailed in the
United States

BUSINESS REPLY MAIL
FIRST CLASS PERMIT No. 5464 – SEATTLE, WASHINGTON

JOHN FLUKE MFG. CO., INC.

P. O. BOX 7428

SEATTLE, WASHINGTON 98133

Attn: Customer Service Dept.

WARRANTY VALIDATION FORM
FLUKE DIGITAL MULTIMETER

To assure validation of your warranty, please provide the following information:

Model 8000A Serial No. ______________ Purchase Date ________________

NOTE

What influenced you to buy the 8000A?

☐ *Advertising and Literature* ☐ *Contact by Local Salesman* ☐ *Other*

Name: ______________________________ Street Address: ______________________________

Company: ___________________________ City: ______________________________

Your Company's Product or Service: ________ State: ______________ Zip: ______________

______________________________ Country if Applicable: ______________________

Form No. A746 12/72

least every 90 days. Storage temperatures below 25°C are recommended.

On page 4-3, paragraph 4-17, add after step d:

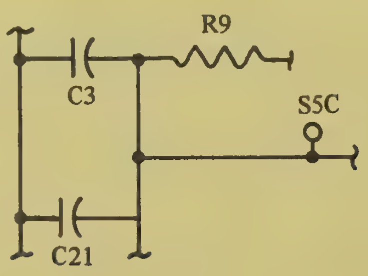
CAUTION!

Damage may result if alkaline, zinc-carbon or mercury batteries are charged.

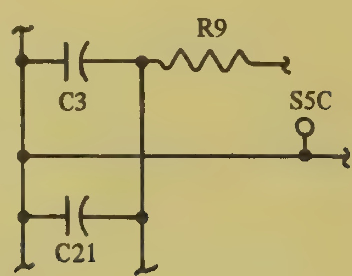
On page 5-5, delete "slo blo" from F1 description and add: fast acting. Add an additional description for F1 as follows: Fuse, slo blo, 1/8 amp 250V (8000A-01), Stock No. 166488, Tot. Qty. 1, Rec. Qty 5. Delete C22 from "C21, C22" and add new listing as follows: C22; cap mica, 390 pf ± 5%, 500V; Stock No. 148437; Tot. Qty. 1.

On schematic diagram, sheet 1 of 2, change C5 (near U2) to C26 and change value of R9 (INPUT DIVIDER) to 100K. Make the following change to the INPUT DIVIDER:

From



To



2/27/73

WARRANTY VALIDATION FORM
FLUKE DIGITAL MULTIMETER

To assure validation of your warranty, please provide the following information:

Model 8000A   Serial No. ______________   Purchase Date ________________

NOTE

What influenced you to buy the 8000A?

☐ *Advertising and Literature*   ☐ *Contact by Local Salesman*   ☐ *Other*

Name: ______________________________   Street Address: ______________________________

Company: ___________________________   City: ______________________________

Your Company's Product or Service: ________   State: ______________   Zip: ____________

___________________________________   Country if Applicable: ________________________

Form No. A746   12/72

CHANGE/ERRATA INFORMATION

MANUAL — TITLE: MODEL 8000A DIGITAL MULTIMETER

ISSUE: October 1972

Please make changes in this manual according to the following change and/or errata information:

CHANGE

On page 1-2, under "AC Voltage", change accuracy specification for "10kHz to 20kHz" to $\pm$(1.0% + 2 digits).

On page 1-4 under "Environmental" add: Shock and Vibration . . . Meets requirements of MIL-T-21200K and MIL-E-16400F.

On page 2-3, add the following note after paragraph 2-14.

NOTE!

Instruments containing nickle-cadmium batteries or nickle-cadmium batteries procured for replacement should not be stored for extended periods of time without recharging at least every 90 days. Storage temperatures below 25°C are recommended.

On page 4-3, paragraph 4-17, add after step d:

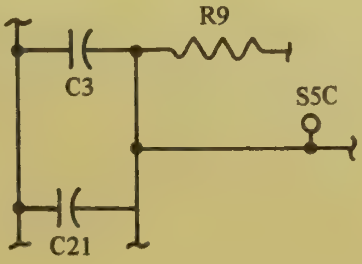
CAUTION!

Damage may result if alkaline, zinc-carbon or mercury batteries are charged.

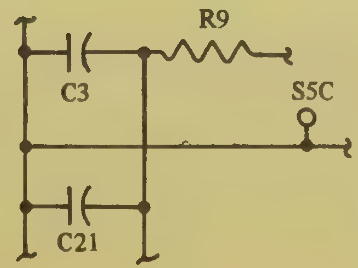
On page 5-5, delete "slo blo" from F1 description and add: fast acting. Add an additional description for F1 as follows: Fuse, slo blo, 1/8 amp 250V (8000A-01), Stock No. 166488, Tot. Qty. 1, Rec. Qty 5. Delete C22 from "C21, C22" and add new listing as follows: C22; cap mica, 390 pf $\pm$ 5%, 500V; Stock No. 148437; Tot. Qty. 1.

On schematic diagram, sheet 1 of 2, change C5 (near U2) to C26 and change value of R9 (INPUT DIVIDER) to 100K. Make the following change to the INPUT DIVIDER:

From



To



2/27/73

FORM NO. A-742

CHANGE/ERRATA INFORMATION

MANUAL — TITLE: MODEL 8000A DIGITAL MULTIMETER

ISSUE: October 1972

Please make changes in this manual according to the following change and/or errata information:

CHANGE

On page 1-2, under "AC Voltage", change accuracy specification for "10kHz to 20kHz" to ±(1.0% + 2 digits).

On page 1-4 under "Environmental" add: Shock and Vibration . . . Meets requirements of MIL-T-21200K and MIL-E-16400F.

On page 2-3, add the following note after paragraph 2-14.

NOTE!

Instruments containing nickle-cadmium batteries or nickle-cadmium batteries procured for replacement should not be stored for extended periods of time without recharging at

TABLE OF CONTENTS

LIST OF ILLUSTRATIONS AND TABLES

SECTION 1

INTRODUCTION & SPECIFICATIONS

1-1. DESCRIPTION

1-2. The compact and light weight Model 8000A is a three and one-half digit multimeter. A unique analog-to-digital conversion technique, with inherent self zeroing, eliminates offset uncertainties. Two LSI chips comprise the analog-to-digital converter allowing a reduction of the discrete electrical component count to less than 110. Other features include automatic digital determination of polarity, continuous filtering, and LED readouts.

1-3. Pushbutton controls allow the selection of five ac and dc voltage ranges, five ac and dc current ranges, and six resistance ranges. Accurate measurement capabilities are from 100 microvolts to 1200 volts ac and dc, 100 nanoamperes to 1.999 amperes ac and dc, and 100 milliohms to 19.99 megohms.

1-4. Accessories and options are available to further increase the capabilities of the instrument. These options and accessories are listed in Table 1-1.

Table 1-1. OPTIONS AND ACCESSORIES

MODEL NO.	NAME OF UNIT
8000A	Mainframe, line powered only
8000A–01	Mainframe w/battery pack
8000A–02	Mainframe, line powered w/data output
PART NO.	ACCESSORY
C80	Carrying Case w/strap
A80	Universal Test Lead Kit
80K-30	High Voltage Probe (1kV to 30kV)
80RF	Rf Probe (100kHz to 500MHz)
80I-200	Clamp-on AC Current Probe (20A to 200A)
M00-100-714	Front Panel Dust Cover
M00-200-612	Rack Mount, Center
M00-200-611	Rack Mount, Side

1-5. SPECIFICATIONS

DC Voltage

Ranges	±199.9mV, ±1.999V, ±19.99V, ±199.9V, ±1199V
Accuracy: 1 year, 15°C to 35° C	±(0.1% of reading +1 digit)
Input Impedance	10 Megohms, all ranges
Normal Mode Rejection	Greater than 60db @ 50Hz, 60Hz
Common Mode Rejection (1kΩ unbalance)	Greater than 120db @ dc and 50Hz, 60Hz
Response Time	1/2 second
Maximum Input Voltage	1200V rms, all ranges

AC Voltage

Ranges	199.9mV, 1.999V, 19.99V, 199.9V, 1199V
Accuracy: 1 year, 15° C to 35° C	45Hz to 10kHz ±(0.5% +2 digits) 10kHz to 20kHz ±(0.7% +2 digits)
Input Impedance	10 megohms in parallel with 100pf
Common Mode Rejection (1kΩ unbalance)	Greater than 60 db @ 50Hz, 60Hz
Response Time	3 seconds, worst case
Maximum Input Voltage	1200V rms, not to exceed 10^7 volt Hz product on 20, 200, 1200V ranges, 500V rms on 200mV and 2V ranges.

DC Current

Ranges	±199.9μA, ±1.999mA, ±19.99mA, ±199.9mA, +1999mA
Accuracy: 1 year, 15° C to 35° C	±(0.3% of reading +1 digit)
Voltage Burden	0.22V maximum up to 2 Amp
Response Time	1/2 second
Maximum Input	2 Amps rms (fuse protected)

AC Current

Ranges	199.9μA, 1.999mA, 19.99mA, 199.9mA, 1999mA
Accuracy: 1 year, 15° C to 35° C	45Hz to 10kHz ±(1.0% of reading +2 digits) except 2000mA range. 45Hz to 3kHz ±(1.0% of reading +2 digits) on 2000mA
Voltage Burden	0.22V maximum up to 2 Amp
Response Time	3 seconds
Maximum Input	2 Amps rms (fuse protected)

Resistance

Ranges	199.9Ω, 1.999kΩ, 19.99kΩ, 199.9kΩ, 1999kΩ, 19.99MΩ
Accuracy: 1 year, 15° C to 35° C	200Ω, 2kΩ, 20kΩ, 200kΩ, 2000kΩ ranges ±(0.2% of reading +1 digit) 20MΩ range ±(0.5% of reading +1 digit)

Response time	200Ω, 2kΩ, 20kΩ, 200kΩ, 2000kΩ ranges: 1/2 second	
	20MΩ range: 4 seconds	
Current through Unknown	200Ω Range	1mA
	2kΩ Range	1mA
	20kΩ Range	100μA
	200kΩ Range	1μA
	2000kΩ Range	1μA
	20MΩ Range	0.1μA
⚠ Maximum Input Voltage	200Ω and 2kΩ Ranges	130V rms
	20kΩ thru 20MΩ Ranges	250V rms

Environmental

Operating Temp. Range	–10° C to +55°C
Storage Temp. Range	–40° C to +75° C (–40° C to +60° C with batteries)
Humidity Range	0 to 80% RH

General

Max. Common Mode Voltage	1200V peak
Display	7-segment LED, 0.25" character height
Size	8 - 1/2" wide x 2 - 1/2" high x 10" deep (see outline drawing for detailed dimensions).
Weight	2 3/4 pounds (1.2Kg) without batteries 4 pounds (1.8Kg) with batteries

Power	100 - 115 - 230V ac, 50 to 400Hz, 2 watts
Battery Option (–01)	8-hour or more operation on internal rechargeable batteries.

1-6. OUTLINE DRAWING

1-7. The Model 8000A Outline Drawing is illustrated in Figure 1-1.

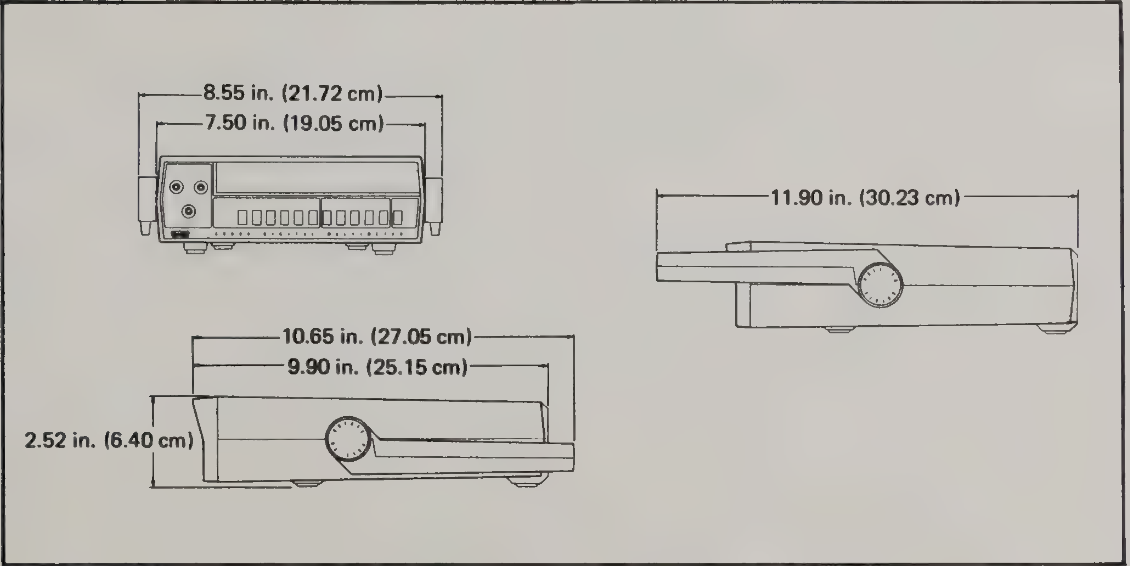


Figure 1-1. MODEL 8000A OUTLINE DRAWING.

SECTION 2

OPERATING INSTRUCTIONS

2-1. INTRODUCTION

2-2. This section contains information regarding installation and operation of the Model 8000A. The contents of this section should be read and understood before operating the digital multimeter. Should any difficulties be encountered during operation, please contact your nearest John Fluke Sales Representative or the John Fluke Mfg. Co., Inc., P. O. Box 7428, Seattle, Washington, 98133, telephone (206) 774-2211. A list of Sales Representatives is located on the inside of the rear cover.

2-3. INPUT POWER

2-4. The Model 8000A and 8000A–01 are supplied with one of three ac input power configurations. These consist of the Model 8000A/10 (100 volts, 50 to 400Hz), Model 8000A (115 volts, 50 to 400Hz), and Model 8000A/23 (230 volts, 50 to 400Hz).

2-5. Before connecting to ac line power, insure that the instrument is in the proper configuration for your power requirements. A decal on the underside of the instrument indicates which ac line voltage is required.

2-6. RACK INSTALLATION

2-7. The Model 8000A may be mounted in a standard 19 inch rack when supplied with the appropriate rack mounting kit (refer to Table 1-1). Rack mounting kits are available to allow left, right or center mounting. Instructions for installing units in the rack mount are supplied with the rack mounting kit.

2-8. OPERATING FEATURES

2-9. The location and function of all controls, connectors, and indicators is shown in Figure 2-1.

2-10. OPERATING NOTES

2-11. Spare Fuse

2-12. The MA INPUT terminal is also the fuseholder for the current protection fuse, F2. A spare fuse is located in a recess on the underside of the carrying handle.

2-13. Battery Power (Option –01)

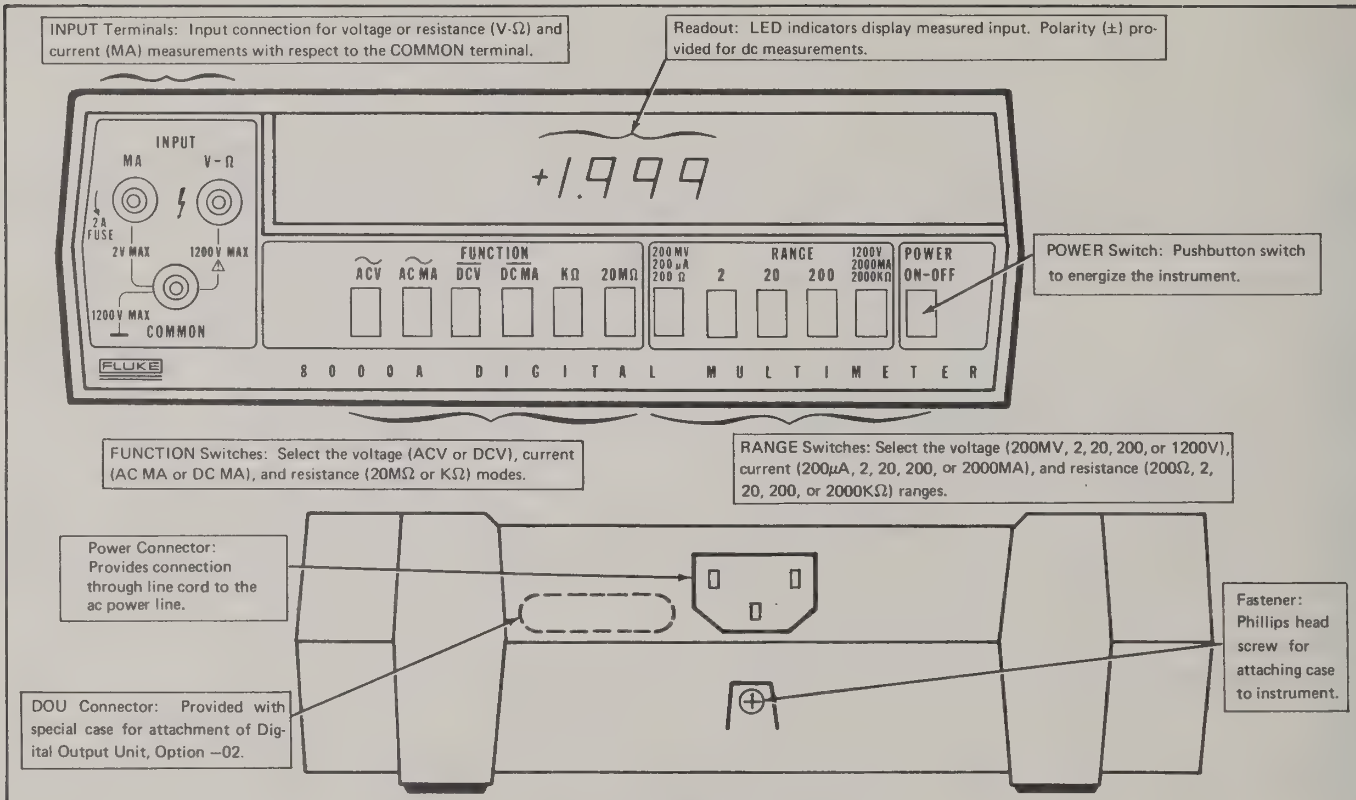


Figure 2-1. OPERATING FEATURES

2-14. Power for the Model 8000A–01 is supplied by internal rechargeable batteries that allow the instrument to operate for at least eight hours. Whenever the light quality of the display is too low to read, the batteries should be recharged. Recharging is most rapidly accomplished by switching to OFF and connecting the instrument to the ac power line. In this way, the discharged batteries can be completely charged in approximately 12 to 14 hours. The instrument can also be operated when recharging on ac power, but recharging time will be extended to approximately 56 hours.

2-15. Input Connections

2-16. Three INPUT terminals (MA, V–Ω, and COMMON) provide connection to the source or resistance under measurement. For source measurements, the MA or V–Ω and COMMON terminals connect to the respective high and low sides of the source. An unknown resistance is connected between the V–Ω and COMMON terminals.

2-17. Overload Protection ⚠

2-18. An overload condition is indicated by the simultaneous flashing of the display readouts. The dc voltage function can sustain up to 1200 volts rms between the V–Ω and COMMON terminals on any range. The ac voltage function can sustain up to 1200 volts rms (not to exceed 10^7 volt hertz) on the 20, 200, and 1200 volt ranges and 500 volts rms on the 200 millivolt and 2 volt ranges between the V–Ω and COMMON terminals. The current input is fuse protected above 2 amperes rms with a maximum of 2 volts rms between the MA and COMMON terminals. Protection for the resistance function is to ⚠ 130 volts rms between the V–Ω and COMMON terminals in the 200 ohm and 2 kilohm ranges, and 250 volts rms in the 20 kilohm through 20 megohm ranges.

2-19. BASIC INSTRUMENT MEASUREMENT

2-20. Measurement instructions for the basic instrument (less Option –02 and accessories) are provided in Table 2-1.

Table 2-1. BASIC MEASUREMENT INSTRUCTIONS

MEASUREMENT	FUNCTION	RANGE	INPUT CONNECTION	REMARKS
DC Volts	DCV	200MV, 2, 20, 200, or 1200V	V–Ω and COMMON	Auto-polarity
DC Milliamperes	DC MA	200μA, 2, 20 200 or 2000MA	MA and COMMON	
AC Volts	ACV	200MV, 2, 20 200, or 1200V	V–Ω and COMMON	— —
AC Milliamperes	AC MA	200μA, 2, 20 200, or 2000MA	MA and COMMON	
Kilohms	KΩ	200Ω, 2, 20 200, or 2000KΩ	V–Ω and COMMON	
Megohms	20MΩ	Any	V–Ω and COMMON	Range switches non-functional

SECTION 3

THEORY OF OPERATION

3-1. INTRODUCTION

3-2. Information about the Model 8000A theory of operation is arranged under two major headings. One heading is titled BLOCK DIAGRAM ANALYSIS. Discussion at the block diagram level consists of the overall operation of the major circuits within the instrument. The other headings are titled CIRCUIT DESCRIPTIONS. At this level, the discussion consists of component functions within the major circuits.

3-3. Block diagrams and simplified schematics are included in this section. Schematic diagrams are located at the rear of this manual.

3-4. BLOCK DIAGRAM ANALYSIS

3-5. Introduction

3-6. Note in the block diagram, Figure 3-1, that the toned areas divide the instrument into three major sections. These sections, Signal Conditioning, Analog-to-Digital Converter, and Display, are discussed separately in the following paragraphs.

3-7. Signal Conditioning

3-8. The Signal Conditioning section provides a dc analog voltage, characteristic of the applied input, to the Analog-to-Digital Converter section. This task is accomplished by the Input Voltage Divider, Current Shunts, AC Converter, Ohms Converter, Active Filter, and associated switching.

3-9. Analog-to-Digital Converter

3-10. The Analog-to-Digital (A/D) Converter section changes the dc output voltage from the Signal Conditioning section to digital information. This is accomplished by a unique A/D conversion technique that eliminates zero error. Two LSI (Large Scale Integration) circuits comprise the A/D Converter. These circuits are the Analog Integrated Circuit and the Digital Integrated Circuit.

3-11. Display

3-12. Digital information from the A/D Converter section is decoded and visually presented by the Display section. The decoded digital information is displayed on numerical LED (Light Emitting Diode) readouts. Decoding of the digital information is accomplished by the Polarity, Decoder Driver, and Anode Control Circuits.

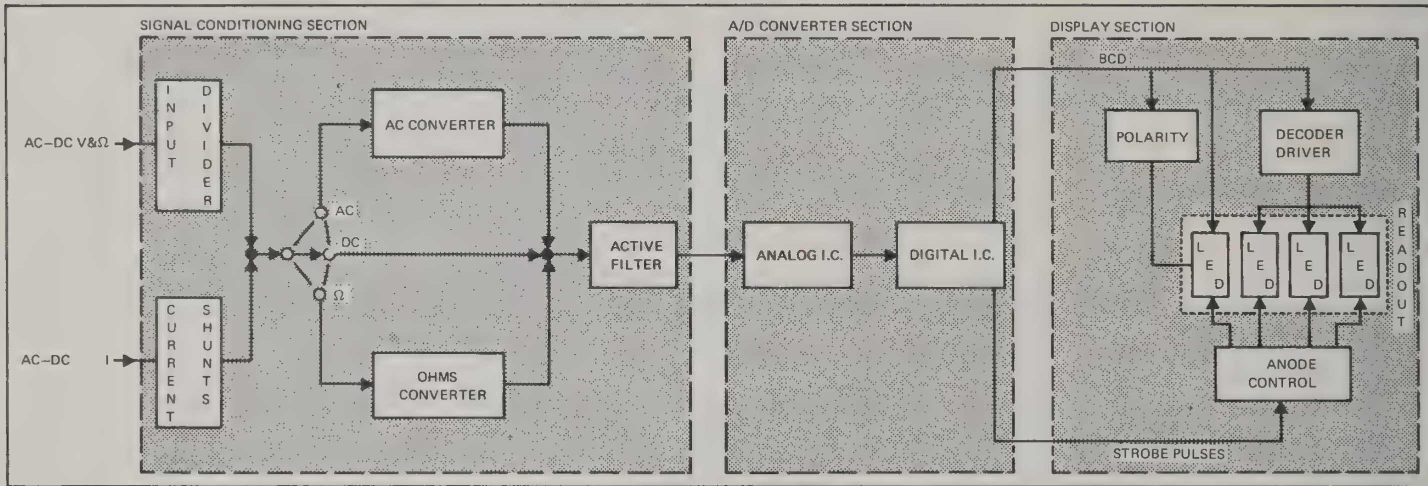


Figure 3-1. MODEL 8000A BLOCK DIAGRAM

3-13. CIRCUIT DESCRIPTIONS

3-14. Analog-to-Digital Converter

3-15. GENERAL. The A/D Converter uses a voltage to frequency conversion technique. A dc voltage at the input of the A/D Converter is changed to a frequency by the Analog Integrated Circuit. This frequency is characteristic of the magnitude and polarity of the dc input voltage. Counting of the output frequency from the Analog I.C. is accomplished by the Digital Integrated Circuit. The resultant count is transferred in BCD (Binary Coded Decimal) format to the Display section.

3-16. ANALOG I.C. The frequency output from the Analog I.C. varies ±40kHz from a rest frequency of approximately 80kHz. Input switching circuitry within the Analog I.C. (refer to Figure 3-2) alternately samples between input common and the dc voltage input at a 120 millisecond rate. During the input common sample period the output of the V/F Converter is at the rest frequency. The following input voltage sample generates an output frequency above or below the rest frequency for a respective negative or positive input voltage. Therefore, the dc input voltage to the A/D Converter becomes a function of the difference of two frequencies and consequently any zero errors are eliminated.

3-17. The resistor R_{range}, in Figure 3-2, symbolizes the dual range capability of the Analog I.C. chip. This resistance, external to the chip, consists of series resistors R23, R57, R25, and R58. When the instrument is in the 2 volt basic range, all four resistors are used to scale the current to the V/F Converter. Variable resistor R25 is the calibration adjustment for this range. For operation in the 0.2 volt basic range, the switching provides a short across R25 and R58. Therefore, only resistor R57 and calibration adjustment R23 scale the current to the proper level for the V/F Converter.

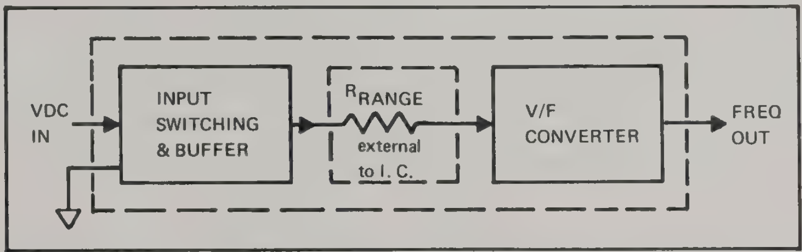


Figure 3-2. ANALOG I.C. BLOCK DIAGRAM

3-18. Timing circuitry for the A/D Converter is contained in the Analog Integrated Circuit. The connection between the Analog I.C. and the Digital I.C. is through R41, Q6, R56, and adjustment R20. Timing adjustment is accomplished by setting PERIOD adjust R20.

3-19. Overload protection for the Analog I.C. is provided by transistors Q20 and Q21. Negative overload voltages are handled by Q20 and positive overloads by Q21.

3-20. DIGITAL I.C. The output from the Analog I.C. alternates between the rest frequency during one time period and a frequency corresponding to the A/D Converter input voltage during the next period. Reversible counters in the Digital I.C. count these frequencies such that their difference is used to provide the BCD information.

3-21. A four line BCD output (W-X-Y-Z on schematic) and a four line strobing pulse output(S1-S2-S3-S4 on schematic) are provided by the Digital I.C. to the Display section. The BCD lines W-X-Y-Z correspond to binary 8-4-2-1 positions respectively.

3-22. Display

3-23. POLARITY. The polarity indicator consists of horizontal and vertical LED segments on DS1. These segments are strobed during the S1 time period, when the instrument is in the DCV or DC MA modes. The horizontal segment is used alone for a negative indication and together with the vertical segment to build a positive indication. Consequently, the horizontal segment must illuminate during each S1 time period. This is accomplished by S3D (DCV) or S4C (DCMA) which ground the cathodes of the horizontal LED segment. Illumination of the vertical segment relies upon the digital information provided by the Y BCD line during S1 time. When a positive voltage or current is applied to the INPUT terminals, the Y line goes high. This turns on Q8 and Q10 which allow the vertical segment to illuminate. With the Y line low, corresponding to a negative input, Q8 and Q10 are cut off and the vertical segment does not illuminate.

3-24. DECODER DRIVER. The Decoder Driver U5 translates the BCD information on the W-X-Y-Z lines for application to the LED readouts DS2, DS3, and DS4. Low inputs are provided by the Decoder Driver through a resistor network RN1 to the LED segments for construction of decimal numbers.

3-25. DECIMAL POINT. LED readouts DS2, DS3, and DS4 contain a decimal point segment. Illumination of a decimal point is controlled by the RANGE switch selected. This causes the resistor network RN2 to supply a negative voltage to the cathode of the decimal segment. Note on the schematic that the 20MΩ FUNCTION, which requires no RANGE selection, shares the 20 RANGE decimal point on DS2.

3-26. ANODE CONTROL. The Anode Control circuit, Q11 through Q18, applies +5 volts dc to the anodes of the LED readouts. Strobe pulses (S1-S2-S3-S4) from the Digital I.C. determines which readout receives the proper anode voltage at a particular time. For example, when S2 goes high Q12 and Q16 turn on and apply approximately +5 volts dc to the anodes of the LED segments on DS2. Those segments with negative voltages on their cathodes, at S2 time, will illuminate and form a decimal number.

3-27. LED READOUTS. The LED readouts DS2, DS3, and DS4 each contain seven and one-half diode segments. One-half segment for a decimal point and 7 segments to form decimal numbers. The number forming segments are designated A through G in each readout on the schematic.

3-28. Readout DS1 indicates the most significant digit (MSD) and polarity. Two segments form a numerical "1" and two segments to form the polarity signs. Control of the MSD "1" indication is separate from the other readouts. BCD information comes from the Z line during the S1 time period. When line Z is high during time S1, Q7, and Q9 turn on to allow the "1" segment to illuminate.

3-29. Signal Conditioning

3-30. INPUT VOLTAGE DIVIDER. Three series connected resistors (R1, R2, and R3) totaling 10 megohms are tapped to provide division ratios of 100 or 1000 to 1. Division ratios for each voltage range are tabulated in the schematic diagram, sheet 1.

3-31. Trimming capacitors are connected across the Input Voltage Divider to maintain a flat frequency response when used for ac voltages. High frequency compensation during calibration can be accomplished with variable trimmer capacitor C3.

3-32. CURRENT SHUNTS. The current shunts consist of resistors R44 through R48. Series connected resistors R44 through R47 are switched into the circuit, depending upon the RANGE selected. The resistor steps are 1000, 100, 10, and 1 ohms for the 0.2, 2, 20, and 200 milliampere ranges respectively. A separate 100 milliohm four terminal shunt is used for the 2000 milliampere range.

3-33. The maximum voltage developed across a single shunt or combination for full range indication is 0.2 volts. Current overload protection above 2 amperes is provided by fuse F2. The shunts are protected against over-voltage by diodes CR9 through CR12.

3-34. AC CONVERTER. The AC Converter consists of a buffer and an active rectifier (refer to Figure 3-3). Transistor Q1, connected as a voltage follower, operates as a buffer for the active rectifier. The buffer output is applied as a voltage, e_{in}, to the non-inverting input of operational amplifier U1. Negative feedback causes the voltage at the inverting input to follow the non-inverting input, causing a current, $e_{in}/R2$, through R2 to ground. Since diodes CR1 and CR2 conduct on alternate half cycles, one-half the average current flows through R1. The rectified voltage developed across R1 is filtered by R3 and C1 to produce the dc voltage required for the A/D Converter.

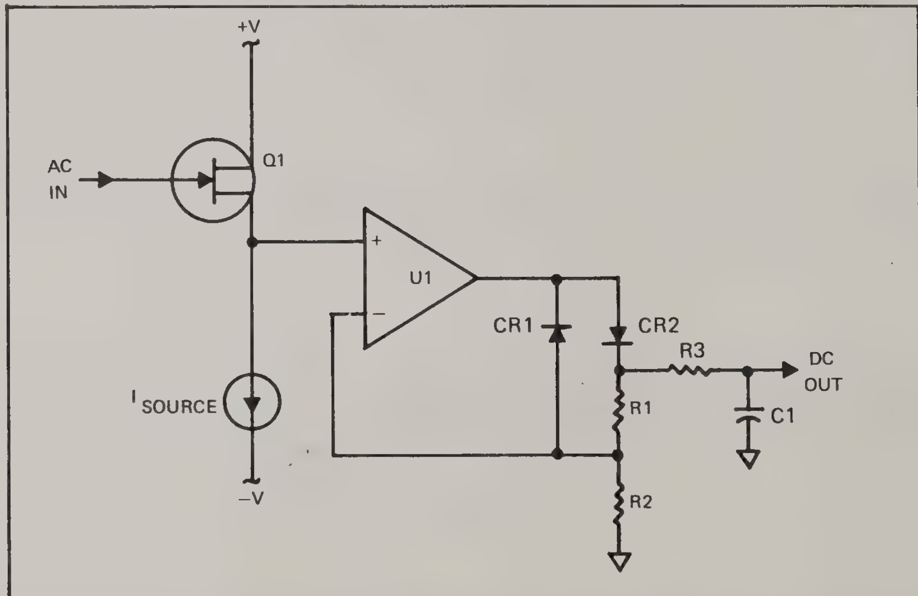


Figure 3-3. AC CONVERTER SIMPLIFIED DIAGRAM

3-35. The input to the AC Converter is in either the 0.2 volt or 2 volt basic range. To accommodate either range, the gain of the operational rectifier is adjusted accordingly by changing the feedback resistor (symbolized by R2). In the instrument, R51 sets the gain at 1 for the 2 volt basic range. For the 0.2 volt basic range, the gain is increased to 10 by switching R50 in parallel with R51.

3-36. OHMS CONVERTER. The Ohms Converter supplies a dc voltage, proportional to the unknown resistance, to the A/D Converter. A simplified diagram of the circuit elements involved is illustrated in Figure 3-4. Operational Amplifier U2 bootstraps the current source. With the non-inverting input connected to the junction of R_A and R_X, current will flow through R_A and R_X such that a constant voltage is maintained across R_A for a given RANGE. If R_X is within the RANGE selected, the voltage developed will be proportional to the value of R_X. For resistance ranges 200 ohms through 2000 kilohms, the constant voltage maintained is 10 volts. In the 20 megohm range, U2's feedback resistor, R_F, is changed so that a 1 volt potential is maintained.

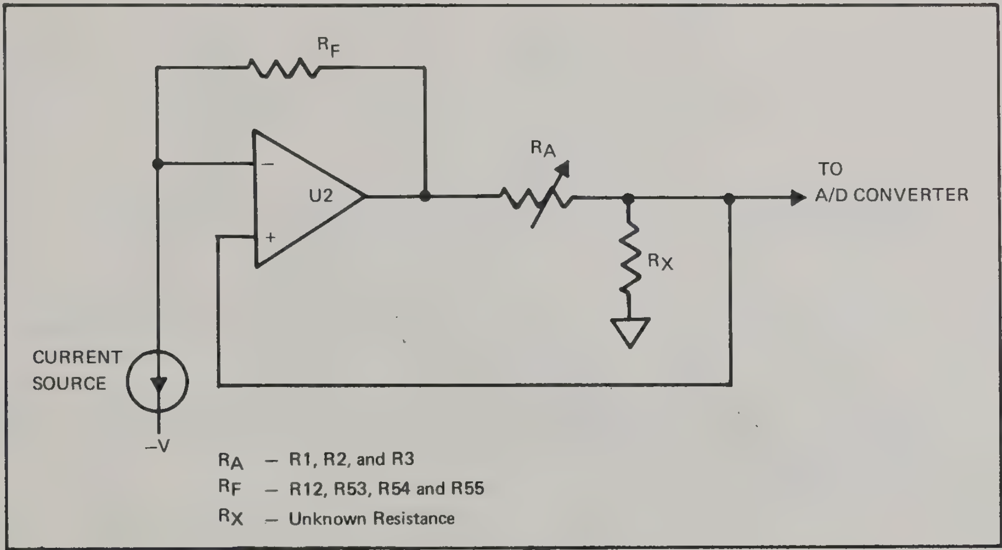


Figure 3-4. OHMS CONVERTER SIMPLIFIED

3-37. ACTIVE FILTER. The Active Filter ensures that the input to the A/D Converter receives only dc voltages. The operational amplifier (U2) used for the Ohms Converter is also used in conjunction with R18, C11, R19, and C12 to form a two pole Bessel type active filter (see Figure 3-5). A cutoff frequency of 10Hz and a 60Hz rejection ratio of 32db is provided by this filter. Normal mode rejection at frequencies other than even multiples of the integration period is also provided. Overloading of the A/D Converter by large ripple voltages is prevented by the filter.

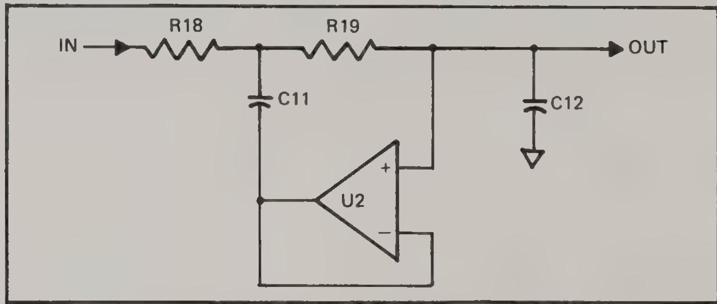


Figure 3-5. ACTIVE FILTER SIMPLIFIED DIAGRAM

3-38. Power Supply

3-39. LINE POWER. The line power supply, shown in sheet 2 of the schematic diagram, provides ±15 and +5 volts dc. Diode bridge CR15 through CR18 and filter capacitors C17 and C18 supply an unregulated ±15 volts. Further conditioning by Q19, CR19, Q24, and CR8 provide the regulated ±15 volts dc. Diodes CR13 and CR14, and filter capacitorC19 supply an unregulated +5 volts.

3-40. BATTERY POWER. The Model 8000A–01 utilizes the battery operated power supply diagrammed on the schematic. With the POWER switch ON, the battery is connected to the input of the dc to dc converter consisting of Q22, Q23, T2, CR15 through CR18, C17, and C18. Transistors Q22 and Q23 and transformer T2 form a 4kHz multivibrator. The multivibrator signal is coupled by T2 to the diode rectifiers CR15 through CR18. Capacitors C17 and C18 filter the rectified voltage to supply the ±15 volts. The unregulated +5 volts is supplied by the battery.

3-41. The battery is charged whenever the instrument is connected to ac line power. Transformer T1, CR13, and CR14 provide the rectified voltage. A lamp, DS5, in parallel with R21 acts as a dynamic current control that limits the charging current to approximately 450 milliamperes. With the instrument connected to line power and the POWER switch OFF, approximately 400 to 450 milliamperes can be supplied to a discharged battery. Approximately 100 millamperes can be supplied when the instrument is switched on.

SECTION 4

MAINTENANCE

4-1. INTRODUCTION

4-2. This section contains information concerning preventive and corrective maintenance for the Model 8000A Digital Multimeter. The information is arranged under the following headings: SERVICE INFORMATION, GENERAL MAINTENANCE, PERFORMANCE TEST, and CALIBRATION PROCEDURE.

4-3. A calibration interval of one year is recommended to ensure instrument operation within the one year specifications. These specifications may be found in Section 1.

4-4. Table 4-1 lists the recommended test equipment. If this equipment is not available, other equipment having equivalent specifications may be used.

Table 4-1. TEST EQUIPMENT

EQUIPMENT NOMENCLATURE	USE	SPECIFICATIONS	RECOMMENDED EQUIPMENT
DC Voltage Source	Calibration, Performance Checks, Troubleshooting	190mV to 1200V ±0.03%	Fluke Model 341A
DC Current Source	Calibration, Performance Checks	190μA to 1.9A ±0.1%	Fluke Model 382A
AC Volatage Source	Calibration, Performance Checks	190mV to 1200V (45Hz to 10kHz) ±0.1% 190mV to 1200V (10kHz to 20kHz) ±0.2%	Fluke Models 5200A/5205A
AC Current Source	Performance Checks	190μA to 190mA (100Hz to 10kHz) ±0.3% 1.9A (100Hz to 3kHz) ±0.3%	Optimation AC 105, and Fluke Models 540B, 382A, A45, and A40 shunts (20mA, 200mA, and 2A)
Resistors	Calibration	190Ω, 1.9kΩ, 19kΩ, 1.9MΩ, and 19MΩ ±0.1%	— — — — — — — —
Frequency Counter	Calibration	To measure positive 100 msec. pulse with 1μsec resolution.	Hewlett-Packard 5326A

4-5. SERVICE INFORMATION

4-6. A unique 48 hour turnaround service is provided for the Model 8000A. Should your instrument need repair, send it to the nearest factory authorized service center. A list of these authorized service centers is located on the inside of the front cover.

4-7. The WARRANTY is also located at the front of this manual and warrants the instrument for a period of one year. In order for the warranty to become effective, the validation card included in the manual must be completed and returned to the John Fluke Mfg. Co., Inc.

4-8. GENERAL MAINTENANCE

4-9. Access

4-10. Use the following procedure to gain access to the interior of the Model 8000A.

a. With the power switch OFF, disconnect the line cord.

b. Remove the Phillips screw at the rear of the instrument case.

c. Remove the instrument from the case.

CAUTION!

When soldering or desoldering on the Model 8000A-01 PCB, either remove one of the batteries or place a thin insulating material between a battery and the holder contact.

4-11. Cleaning

4-12. Clean the front panel and case with denatured alcohol or a mild solution of detergent and water. Do not use aromatic hydrocarbons or chlorinated solvents because they will react with the plastic materials of the instrument.

4-13. Fuse Replacement

4-14. The input power fuse is located within the instrument in a fuse clip near the power transformer (T1). To gain access to the fuse, refer to paragraph 4-9. When replacement is required, install AGC 1/8A as indicated on the decal on the underside of the instrument case.

4-15. The current shunt protection fuse is located behind the front panel. To remove the fuse, turn the MA input terminal in the direction indicated on the front panel. When replacement is required, install AGX 2A as indicated on the front panel and on the decal on the underside of the instrument case. Spare fuses can be stored in the underside of the carrying handle.

4-16. Battery Replacement (Option 8000A-01)

4-17. Follow the disassembly instructions below for removing the replaceable batteries in the Model 8000A-01.

a. Remove the instrument from the case (refer to paragraph 4-9.)

b. On the underside of the PCB, remove the two threaded bolts securing the battery holders.

c. Remove the holder tops and batteries.

d. Replace the batteries with 1.2 volt nickel-cadmium batteries (JF Part No. 346924). Install the batteries in the polarity indicated on the battery holder.

4-18. PERFORMANCE CHECKS

4-19. Environmental Conditions

4-20. The environmental conditions for conducting the performance checks are as follows.

a. Ambient Temperature — 22°C to 25°C (72°F to 77°F)

b. Relative Humidity —— 70%

4-21. "Zero" Checks

a. With the instrument energized, depress the DCV and 200MV pushbuttons.

b. Short the VΩ terminal to the COMMON terminal. The readout should indicate $\leqslant 1$ digit.

c. Remove the short. The readout should indicate $\leqslant \pm 10$ digits.

4-22. Normal Mode Rejection Check

a. With the instrument energized by line power, depress the VDC function and 20 range pushbuttons.

b. Apply ac power line voltage between the V-Ω and COMMON terminals.

c. The readout should indicate 0± 2 digits. (If necessary, refer to paragraph 4-30, Normal Mode Rejection Adjustment.)

4-23. Accuracy Checks

4-24. The accuracy checks compare the instruments performance to the accuracy specifications listed in Section 1. Use Table 4-3, disregarding the "ADJUSTMENT" column, since the display limits for a given input are listed. For the AC current performance checks, refer to Table 4-2, AC MA PERFORMANCE CHECKS.

4-25. CALIBRATION

4-26. Environmental Conditions

4-27. Instrument calibration should be accomplished under the following environmental conditions.

a. Ambient Temperature — 22°C to 25°C (72°F to 77°F)

b. Relative Humidity ——— 70%

4-28. "Zero" Checks

4-29. Verify that the open circuit and short circuit zero is within the limits specified in paragraph 4-21.

4-30. Normal Mode Rejection Adjustment

4-31. Refer to the Normal Mode Rejection Check in paragraph 4-22, to determine if adjustment is necessary. Should adjustment be required, use the following procedure.

a. Remove the instrument from the case (refer to paragraph 4-9).

b. Connect a frequency counter, set for period measurement, between TP5 (see Figure 4-1) and COMMON (or TP4).

c. Adjust R20, "PERIOD", for a 100,000 microsecond indication on the counter. Variations of the indication should be $\leqslant \pm 15\ \mu sec$.

Table 4-2. AC MA PERFORMANCE CHECKS

FUNCTION/RANGE	INPUT	DISPLAY LIMITS
AC MA / 200μA	190μA @ 100 Hz	186.1 to 193.9
AC MA / 200μA	190μA @ 10 kHz	186.1 to 193.9
AC MA / 2	1.9 mA @ 100 Hz	1.861 to 1.939
AC MA / 2	1.9 mA @ 10 kHz	1.861 to 1.939
AC MA / 20	19 mA @ 100 Hz	18.61 to 19.39
AC MA / 20	19 mA @ 10 kHz	18.61 to 19.39
AC MA / 200	190 mA @ 100 Hz	186.1 to 193.9
AC MA / 200	190 mA @ 10 kHz	186.1 to 193.9
AC MA / 2000 MA	1.9 A @ 100 Hz	1861 to 1939
AC MA / 2000 MA	1.9A @ 3 kHz	1861 to 1939

4-32. Range Adjustments

4-33. Refer to Figure 4-1 for the location of the range adjustments. Table 4-3 lists the order of the adjustments and cardinal check points. Apply the inputs listed and adjust or check for in-limits indications.

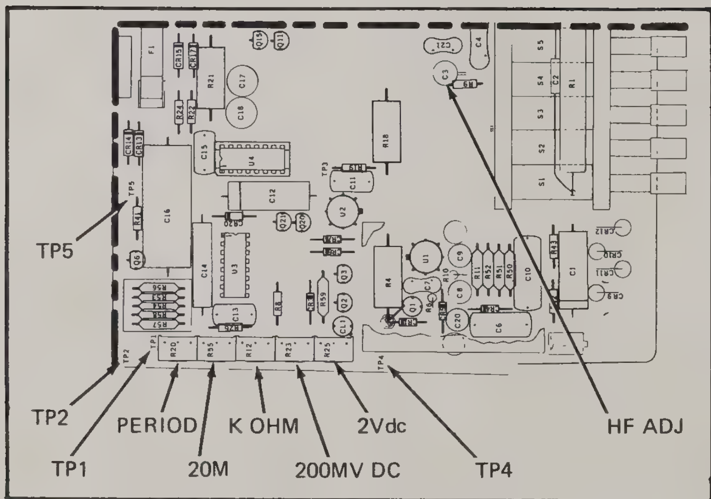


Figure 4-1. ADJUSTMENT AND TEST POINT LOCATIONS

Table 4-3. CALIBRATION

FUNCTION/RANGE	INPUT	ADJUSTMENT	DISPLAY LIMITS
DCV / 200 MV	+0.19V dc	"200 MVDC" (R23) Adjust for +190.0	+189.7 to +190.3
DCV / 200 MV	-0.19V dc	--------	-189.8 to -190.2
DCV / 2	+1.9V dc	"2 VDC" (R25) Adjust for +1.900	+1.897 to +1.903
DCV / 2	-1.9V dc	--------	-1.898 to -1.902
DCV / 20	+19V dc	--------	+18.97 to +19.03
DCV / 200	+190V dc	--------	+189.7 to +190.3
DCV / 1200V	+1000V dc	--------	+997 to +1003
20MΩ	19MΩ	"20 M" (R55) Adjust for 19.00	18.89 to 19.11
KΩ / 20	19KΩ	"K OHM" (R12) Adjust for 19.00	18.95 to 19.05
KΩ / 200Ω	190Ω	--------	189.5 to 190.5
KΩ / 2	1.9KΩ	--------	1.895 to 1.905
KΩ / 200	190KΩ	--------	189.5 to 190.5
KΩ /2000KΩ	1.9MΩ	--------	1895 to 1905

FUNCTION/RANGE	INPUT	ADJUSTMENT	DISPLAY LIMITS
DC MA / 200μA	+190μA	--------	+189.3 to +190.7
DC MA / 2	+1.9mA	--------	+1.893 to +1.907
DC MA / 20	+19mA	--------	+18.93 to +19.07
DC MA / 200	+190mA	--------	+189.3 to +190.7
DC MA / 2000 MA	+1.9A	--------	+1893 to 1907
ACV / 200 MV	190mV @ 100Hz	--------	188.8 to 191.2
ACV / 200 MV	190mV @ 20kHz	--------	189.1 to 190.9
ACV / 2	1.9V @ 100 Hz	--------	1.888 to 1.912
ACV / 2	1.9V @ 20kHz	--------	1.867 to 1.933
ACV / 20	19V @ 20kHz	"HF ADJ" (C3) Adjust for 19.00	18.67 to 19.33
ACV / 20	19V @ 10 kHz	--------	18.67 to 19.33
ACV / 200	190V @ 10 kHz	--------	186.7 to 193.3
ACV / 200	190 @ 20 kHz	--------	186.7 to 193.3
ACV / 1200V	1000V @ 100 Hz	--------	983 to 1007
ACV / 1200V	1000V @ 10 kHz	--------	981 to 1009

SECTION 5

5-1. INTRODUCTION

5-2. The parts list contains a complete breakdown of all the major assemblies followed by subsequent listings that itemize the components on each major assembly. Assemblies and subassemblies are identified by a reference designation beginning with the letter A followed by a number (e.g., A1 etc.). Electrical components appearing on the schematic diagram are identified by their schematic diagram reference designation. Components not appearing on the schematic diagram are consecutively numbered throughout the parts list. Flagnotes are used throughout the parts list and refer to special ordering explanations.

5-3. A manufacturer's cross reference list follows the parts list. The manufacturer's part number and Federal Supply Code are listed opposite the John Fluke Mfg. Co. part number for the item.

5-4. COLUMN DESCRIPTION

a. The REF DESIG column indexes the item description to the associated illustration.

b. The DESCRIPTION column describes the salient characteristics of the component. Indention of the description indicates the relationship to other assemblies, components, etc. Those component descriptions that are unique to the Model 8000A–01 are designated by the model number in paranthesis following the description.

c. The six-digit part number, by which the item is identified at the John Fluke Mfg. Co., is listed in the STOCK NO. column.

d. The TOT QTY column lists the total quantity of the items used in the instrument and reflects the latest Use Code. Second and subsequent listings of the same item are referenced to the first listing with the abbreviation REF.

e. Entries in the REC QTY column indicate the recommended number of spare parts necessary to support one to five instruments for a period of two years. This list presumes an availability of common electronic parts at the maintenance site.

f. The USE CODE column identifies certain parts which have been added, deleted or modified during the production of the instrument. Each part for which a Use Code has been assigned may be identified with a particular instrument serial number by consulting the Serial Number Effectivity List at the end of the parts list. All parts with no code are used on all instruments with serial numbers above 123.

5-5. HOW TO OBTAIN PARTS

5-6. Standard components may be ordered directly from the manufacturer by using the manufacturer's part number, or parts may be ordered from the John Fluke Mfg. Co. factory or authorized representative by using the Fluke part number. In the event the part you order has been replaced by a new or improved part, the replacement will be accompanied by an explanatory note and installation instructions, if necessary.

5-7. You can insure prompt and efficient handling of your order to the John Fluke Mfg. Co. if you include the following information: Quantity, FLUKE Stock Number, Description, Reference Designation and Instrument model and serial number. If you must order structural parts not listed in the parts list, describe the part as completely as possible.

5-8. SERIAL NUMBER EFFECTIVITY

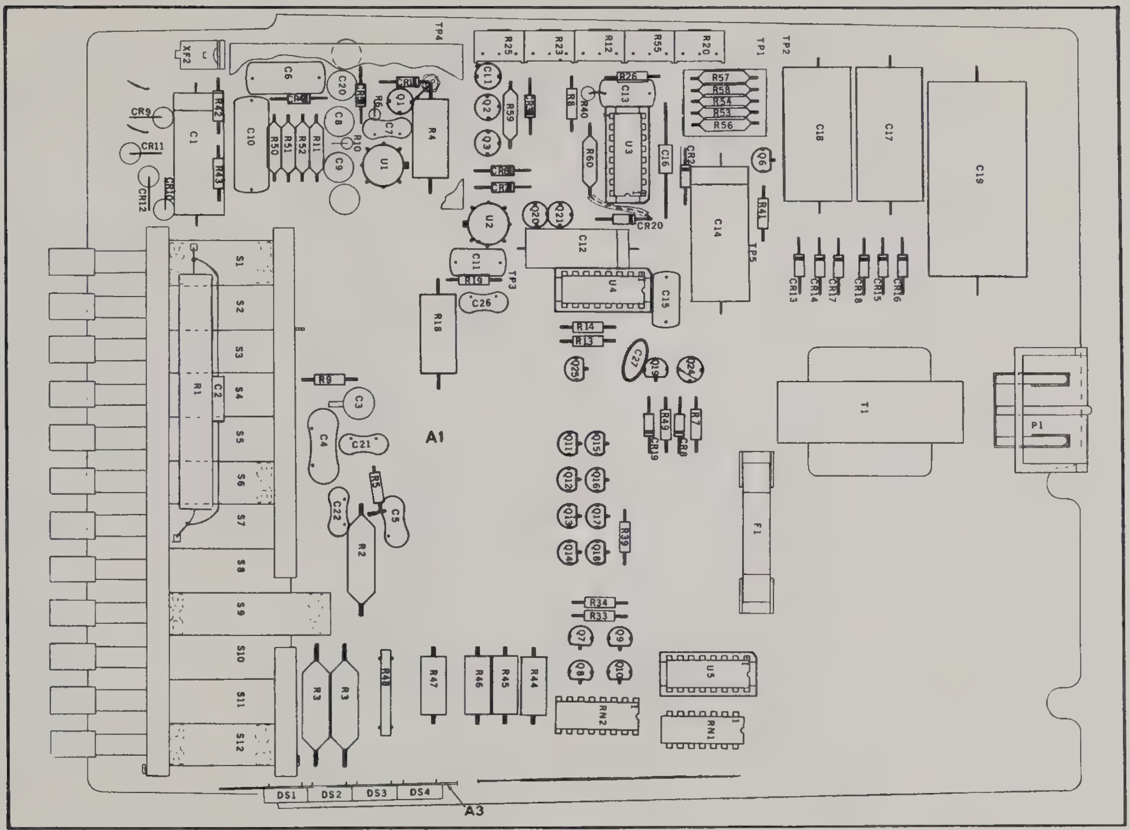


Figure 5-1. 8000A MAIN PCB ASSEMBLY

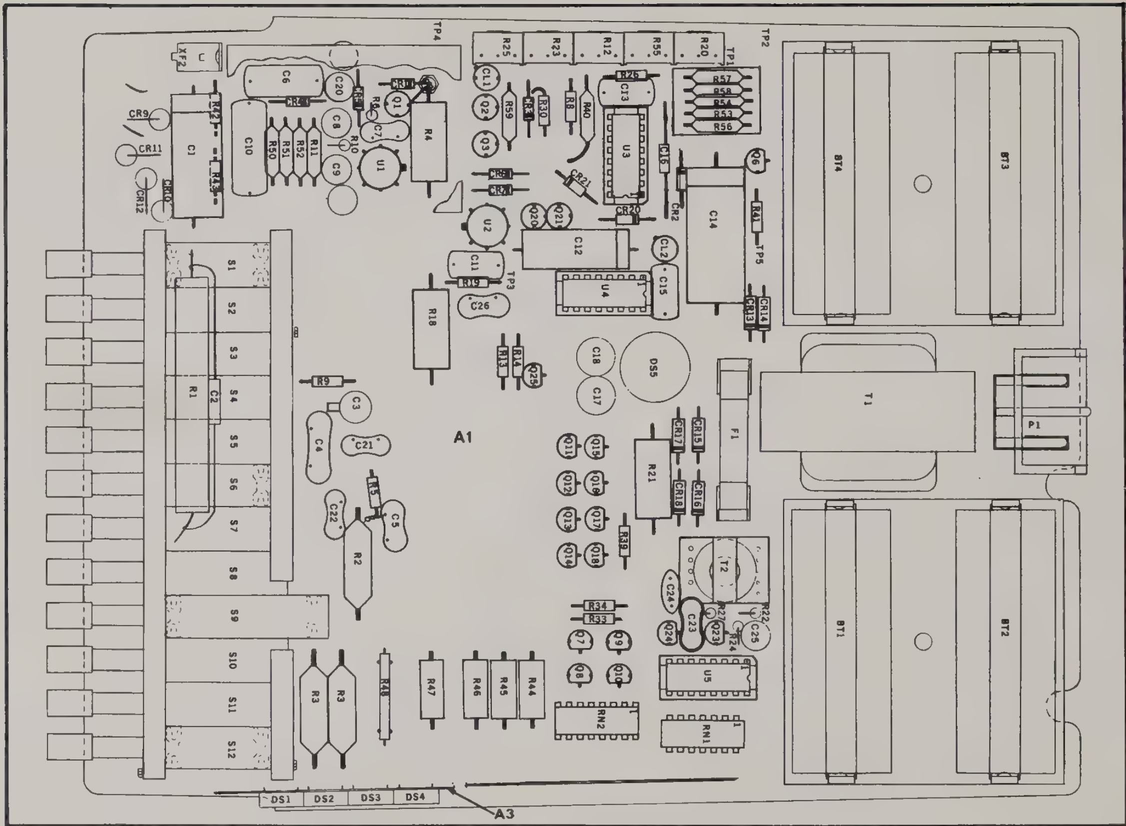


Figure 5-2. 8000A–01 MAIN PCB ASSEMBLY

REF DESIG	DESCRIPTION	STOCK NO	TOT QTY	REC QTY	USE CODE
	8000A DIGITAL MULTIMETER INSTRUCTION MANUAL	347906	1		
	DIGITAL MULTIMETER **Figure 5-1 & Figure 5-2**	8000A & 8000A-01			
A1	Main PCB Assembly (8000A)	338293	1		
	Main PCB Assembly (8000A/10)	346106	1		
	Main PCB Assembly (8000A/23)	346114	1		
	Main PCB Assembly (8000A-01)	345967	1		
	Main PCB Assembly (8000A-01/10)	346080	1		
	Main PCB Assembly (8000A-01/23)	346098	1		
A2	FRONT PANEL ASSEMBLY				
A3	DISPLAY ASSEMBLY	338376	1		
	Case, molded	330076	1		
	Handle, molded	330992	1		
	Line Cord Assembly	343723	1		
	Line Cord Assembly (/10 & /23)	343780	1		
	Pad, foot	338632	4		
	Test Lead Set	343657	1		
A1	MAIN PCB ASSEMBLY	REF			
BT1, BT2, BT3, BT4	Battery, 1.2V, Ni Cad, (8000-01 only)	346924	4		
C1	Cap, plstc, 0.033µf, 1200V	352120	1		
C2	Cap, porcelain, 5.1pf 1V	347948	1		
C3	Cap, var, cer, 4.5 to 50pf +70/−20%	321117	1	1	
C4	Cap, mica, 560pf ±5%, 500V	170431	1		
C5	Cap, mica, 56pf ±5%, 500V	148528	1		
C6, C15	Cap, plstc, 0.22µf ±10%, 250V	194803	2		
C7	Cap, mica, 33pf ±5%, 500V	160317	1		
C8	Cap, ta 68µf ±10%, 15V	193615	1		
C9, C20, C23	Cap, ta, 10µf ±20%	330662	3		
(C9, C20, C25)	Cap, ta, 10µf ±20%, (8000A-01 only)	330662	3		
C10	Cap, plstc, 0.07µf ±10%, 250V	184366	1		
C11	Cap, plstc, 0.033µf ±10%, 250V	234492	1		

REF DESIG	DESCRIPTION	STOCK NO	TOT QTY	REC QTY	USE CODE
C12	Cap, poly, 0.022µf ±10%, 100V	333823	1		
C13	Cap, plstc, 0.047µf ±10%, 250V	162008	1		
C14	Cap, fxd, poly, 0.22µf ±5%, 50V	348359	1		
C16	Cap, fxd, poly, 390pf ±5%, 50V	348367	1		
C17, C18	Cap, elect, 400µf ±50/−10%, 25V	168153	2	1	
	Cap, tant, 47µf ±20%, 20V (8000A-01 only)	348516	2		
C19	Cap, elect, 4000µf 500mA, 10V	330761	1	1	
C21, C22	Cap, mica, 39pf ±5%, 500V	148544	2		
C24	Cap, cer, 0.0012µf ±10%, 500V (8000A-01 only)	106732	1		
C26	Cap, mica, 100pf ±5%, 500V	148494	1		
CL1, CL2	Diode, FED, cur. reg., 1000mA ±20% (CL2 used in 8000A-01 only)	348482	2	1	
CR1, CR4, CR5	Diode, sil, 75mA 25piv	241422	3	1	
CR2	Diode, Zener, 10V ±5%	246611	1		
CR3	Matched Set	2			
CR8, CR19	Diode, Zener 15V ±5% (CR19 not used in 8000A-01)	352377	2	1	
CR6, CR7, CR13 thru CR18	Diode, Si, rectifier, 1 amp	343491	8	2	
(CR6, CR7)	Diode, Si, rectifier, 1 amp (8000A-01 only)	343491	2	1	
(CR13 thru CR18)	Diode, Si, 150 mA (8000A-01 only)	203323	6	2	
CR9 thru CR12	Diode, rectifier, Si, 2 amp 50V	347559	4	1	
CR20	Matched Set	1	1		
CR21	Diode, Zener, 6.8V ±5%	352898	1		
DS5	Lamp, GE 63 (8000A-01 only)	352237			
F1	Fuse, slo blo 1/8 amp 250V	196790	1	5	
XF1	Fuse clip	284984	1		
XF2	Fuse contact	338665	1		
P1	Plug, 3 prong, power				
	Contact, voltage	338657	2		
	Contact, earth common	338640	1		
	Insulator, line contact	338624	1		
	Insulator, line contact (8000A-01 only)	344184	1		

REF DESIG	DESCRIPTION	STOCK NO	TOT QTY	REC QTY	USE CODE
Q1	Xstr, FET, N-Channel	288324	1	1	
Q2, Q3	Xstr, Si, NPN	168716	2	1	
Q7thruQ10, Q15 thru Q18	Xstr, Si, NPN	218396	8	2	
Q11 thru Q14, Q19	Xstr, Si, PNP (Q19 - Line models only)	340026 340026	4 1	1	
Q20	Xstr, Si, NPN	352138	1		
Q21	Xstr, Si, PNP	352146	1	1	
Q22, Q23	Xstr, Si, NPN (8000A-01 only)	330803	2	1	
Q24	Xstr, Si, NPN	168708	1		
Q25	Xstr, FET, N-Channel	261388	1	1	
R1, R2, R3	Resistor, matched Set	3	1		
R4	Res, comp, 100k ±10%, 2W	158659	1		
R5	Res, comp, 680k ±5%, 1/4w	188433	1		
R6	Res, comp, 4.7M ±5%, 1/4w	220046	1		
R8, R49	Res, fxd, car dep, 1k ±5%, 1/3w (R49 deleted from 8000A-01)	343426	2		
R9, R26	Res, comp, 100k ±5%, 1/4w	148189	2		
R10, R42, R43	Res, fxd, car dep, 470k ±5%, 1/3w	342634	3		
R11	Res, met flm, 10k ±1%, 1/8w	168260	1		
R12	Res, var, cermet, 500Ω ±10%, 1w	291120	1	1	
R13	Res, comp, 39k ±5%, 1/4w	188466	1		
R14	Res, comp, 3.3k ±5%, 1/4w	148056	1		
R18	Res, comp, 470k ±10%, 2w	110247	1		
R19	Res, fxd, car dep, 560k ±5%, 1/3w	342642	1		
R20	Res, var, cermet, 20k ±10%, 1/2w	291609	1	1	
R21	Res, comp, 22Ω ±5%, 2w (8000A-01 only)	352229	1		
R22	Res, comp, 330Ω ±5%, 1/4w (8000A-01 only)	147967	1		
R24	Res, comp, 82Ω ±5%, 1/4w (8000A-01 only)	149484	1		
R23	Res, var, cermet, 100Ω ±10%, 1w	285130	1	1	

REF DESIG	DESCRIPTION	STOCK NO	TOT QTY	REC QTY	USE CODE
R25	Res, var, cermet, 1k ±10%, 1/2w	285155	1	1	
R27	Res, comp, 22Ω ±5%, 1/4w (8000A-01 only)	147967	1		
R30	Res, comp, 6.8k ±5%, 1/4w (8000A-01 only)	148098	1		
R33, R34, R41	Res, fxd, car dep, 3.9k ±5%, 1/3w	342600	3		
R39	Res, fxd, car dep 470Ω ±5%, 1/3w	343434	1		
R40	Res, met flm, 215k ±1%, 1/8w	289470	1		
R44 thru R47	Res, ww, matched set	4			
R48	Res, ww, 0.1Ω ±0.1%, 1/2w	345579	1	1	
R50	Res, met flm, 498Ω ±0.1%, 1/8w	352252	1		
R51	Res, met flm, 4.53k ±0.1%, 1/8w	343467	1		
R52	Res, met flm, 10.02k ±0.1%, 1/8w	352245	1		
R53, R54	Resistor, matched set	2	1		
R55	Res, var, cermet, 50Ω ±10%, 1w	285122	1	1	
R56, R57,	Resistor, matched set	1	1		
R59	Resistor, matched set	2	1		
R60	Resistor, met flm, 5.62k ±1%, 1/8w	235168	1		
RN1	Resistor network, 8 pc.	344069	1	1	
RN2	Resistor network, fxd., 11pc.	344077	1		
S1 thru S12	Switch assembly, pushbutton	342915	1	1	
T1	Xformer, 115V (8000A and 8000A-02) Xformer, 230V (8000A and 8000A-02) Xformer, 115V (8000-01) Xformer, 230V (8000-01) Xformer, 100V (8000A and 8000A-02) Xformer, 100V (8000A-01)	345629 345629 345637 345637 345645 345652	1 1 1 1 1 1		
T2	Xformer, inverter (8000A-01)	346049	1		
U1	I.C. Op. Amp. (AC Converter)	271502	1		
U2	I.C. Op Amp (Ohms Converter)	2	1		
U3	Analog I.C.	1	1		
U4	Digital I.C.	326017	1	1	
U5	I.C., TTL, BCD to 7-Seg. (Decoder Driver)	340109	1	1	

REF DESIG	DESCRIPTION	STOCK NO	TOT QTY	REC QTY	USE CODE
XF2	Contact, fuseholder (see J2XF2)	338665	1		
	Contact, battery (8000A-01 only)	344200	8		
	Holder, battery (8000A-01 only)	346932	2		
	Post, connector, uninsulated	267500	3		
	Shield, AC Converter	338673	1		
	Socket, I.C., 16 pin, Dual-in-Line (U3, U4, U5)	351916	3		
	Socket, Short, 10-Contact	347815	1		
	1 CR20, R56, R57, R58, and U3 are a matched set. For replacement, order ANALOG I.C. RESISTOR SET, STOCK NO. 345496.				
	2 CR3, R53, R54, R59, and U2 are a matched set. For replacement, order OHMS CONVERTER RESISTOR SET, STOCK NO. 345504.				
	3 R1, R2, and R3 are a matched set. For replacement, order INPUT DIVIDER RESISTOR SET, STOCK NO. 306407.				
	4 R44, R45, R46, and R47 are a matched set. For replacement, order CURRENT SHUNT RESISTOR SET, STOCK NO. 312611.				
	NOTE: If one or more components in a set require replacement, the entire set must be replaced.				

REF DESIG	DESCRIPTION	STOCK NO	TOT QTY	REC QTY	USE CODE
A2	FRONT PANEL ASSEMBLY				
F2	Fuse, fast acting, 2 amp	346940	1	5	
J1	Jack, banana, red	162065	1		
J2/XF2	Jack/Fuseholder, banana/barrel, red	345611	1		
J3	Jack, banana, black	162073	1		
	Lens, red	336616	1		
	Retainer, Neoprene Grommet	352484	2		
	Panel, front, molded (no decal)	330084	1		
	Decal, Front Panel	343756			
A3	DISPLAY ASSEMBLY	REF			
DS1	Diode, Light-emitting, alpha numeric, (± & 1) red	334581	1	1	
DS2, DS3,	Diode, Light-emitting, alpha numeric, (0-9) red	334573	3	1	
	Printed Circuit, Display	338343	1		

MANUFACTURERS' CROSS REFERENCE LIST

FLUKE STOCK NO	MFR.	MFR. PART NO.	FLUKE STOCK NO.	MFR.	MFR. PART NO.
106732	71590	CF122	271502	12040	LM301A
110247	01121	RC42GF	284984	89536	284984
147884	01121	CB2205	285122	71450	360S-500A
147967	01121	CB3315	285130	71450	360S-101A
148056	01121	CB3325	285155	71450	360S-102A
148098	01121	CB6825	288324	15818	U2412
148189	01121	CB1045	288761	07933	RS2048
148528	14655	CD15F560J	289470	91637	MFF1/8
148544	14655	CD15E390J	291120	71450	360S-501A
149484	01121	CB8205	291609	71450	360S-203A
158659	01121	HB1041	306407	89536	306407
160317	14655	CD15E330J	312611	89536	312611
162065	74970	108-902	321117	73899	DVJ305A
162008	73445	C280AEA47K	326017	89536	326017
162073	74970	108-903	330076	89536	330076
168153	73445	C437ARF400	330084	89536	330084
168260	91637	Type MFF 1/8	330092	89536	330092
168708	03508	2N3391	330662	12954	D10GSB20M
168716	07263	S19254	330761	99392	61C10AS43
170431	14655	CD19F561J	330803	07263	MPS6560
184366	73445	C280AE/A470K	333823	02799	1PJ223K
188433	01121	CB6845	334573	29083	MAN10A
188466	01121	CB3935	334581	29083	MAN101A
193615	56289	196D686X0015	335455	89536	335455
196790	71400	Type AGC	336616	89536	336616
203323	03508	DHD1105	338293	89536	338293
218396	04713	2N3904	338376	89536	338376
220046	01121	CB4755	338624	89536	338624
234492	73445	C280AE/A33K	338632	89536	338632
241422	03508	IN4009	338640	89536	338640
261388	04713	SPF179	338657	89536	338657
267500	89536	267500	338665	89536	338665

MANUFACTURERS' CROSS REFERENCE LIST

FLUKE STOCK NO.	MFR.	MFR. PART NO.	FLUKE STOCK NO.	MFR.	MFR. PART NO.
338673	89536	338673	346932	89536	346932
340026	04713	MPS6563	346940	89536	346940
340109	18324	SN7447	347542	89536	347542
342600	Toyo Electronics	R33	347559	14099	IN5400
342634	Toyo Electronics	R33	347815	82305	14-77
342642	Toyo Electronics	R33	347948	89536	347948
342915	89536	342915	348482	17856	E505
343426	Toyo Electronics	R33	348516	56289	196D
343434	Toyo Electronics	R33	348359	13934	H8S
343467	91637	MFF1/8	348367	12934	H8S
343491	11711	IN4002	351916	82305	14-40P
343657	89536	343657	352138	89536	352138
343723	89536	343723	352229	01121	HB
343780	89536	343780	352237	08806	63
344069	89536	344069	352245	91637	MMF1/8
344077	89536	344077	352252	91637	MMF1/8
344184	89536	344184	352377	03877	SV4823
344200	89536	344200	352898	89536	352898
345496	89536	345496			
345504	89536	345504			
345579	89536	345579			
345611	89536	345611			
345629	89536	345629			
345637	89536	345637			
345645	89536	345645			
345652	89536	345652			
346049	89536	346049			
346924	89536	346924			

APPENDIX – FEDERAL SUPPLY CODE FOR MANUFACTURERS

A-1. CODE TO NAME

A-2. The following five digit code numbers are listed in numerical sequence along with the manufacturer's name and address to which the code has been assigned. The Federal Supply Code has been taken from Cataloging Handbook H 4-2, Code to Name.

01121 Allen-Bradley Co.
Milwaukee, Wisconsin

02799 Arco Capacitors, Inc.
Torrence, California

03508 General Electric Co.
Semiconductor Products
Syracuse, New York

03877 Transitron Electronic Corp.
Wakefield, Massachusetts

04713 Motorola Semiconductor Products Inc.
Phoenix, Arizona

07263 Fairchils Semiconductor
Div. of Fairchild Camera
& Instrument Corp.
Mountain View, California

07910 Teledyne Corp.
(Continental Device)
Hawthorne, California

07933 Ratheon Co.
Mountain View, California

08806 General Electric Co.
Miniature Lamp Dept.
Cleveland, Ohio

11711 General Instrument Corp.
Newark, New Jersey

12040 National Semiconductor Corp.
Danburry, Connecticut

12954 Dickson Electronics Corp.
Scottsdale, Arizona

13934 Midwec Corp.
Oshkosh, Nebraska

14099 Semtech Corp.
Newbury Park, California

17856 Siliconix, Inc.
Sunnyvale, California

18324 Signetics Corp.
Sunnyvale, California

29083 Monsanto, Co., Inc.
Santa Clara, California

56289 Sprague Electric Co.
North Adams, Massachusetts

71400 Bussmann Mfg.
Div. of McGraw - Edison Co.
Saint Louis, Missouri

71450 CTS Corp.
Elkhart, Indiana

71590 Centralab
Div. of Globe Union Inc.
Milwaukee, Wisconsin

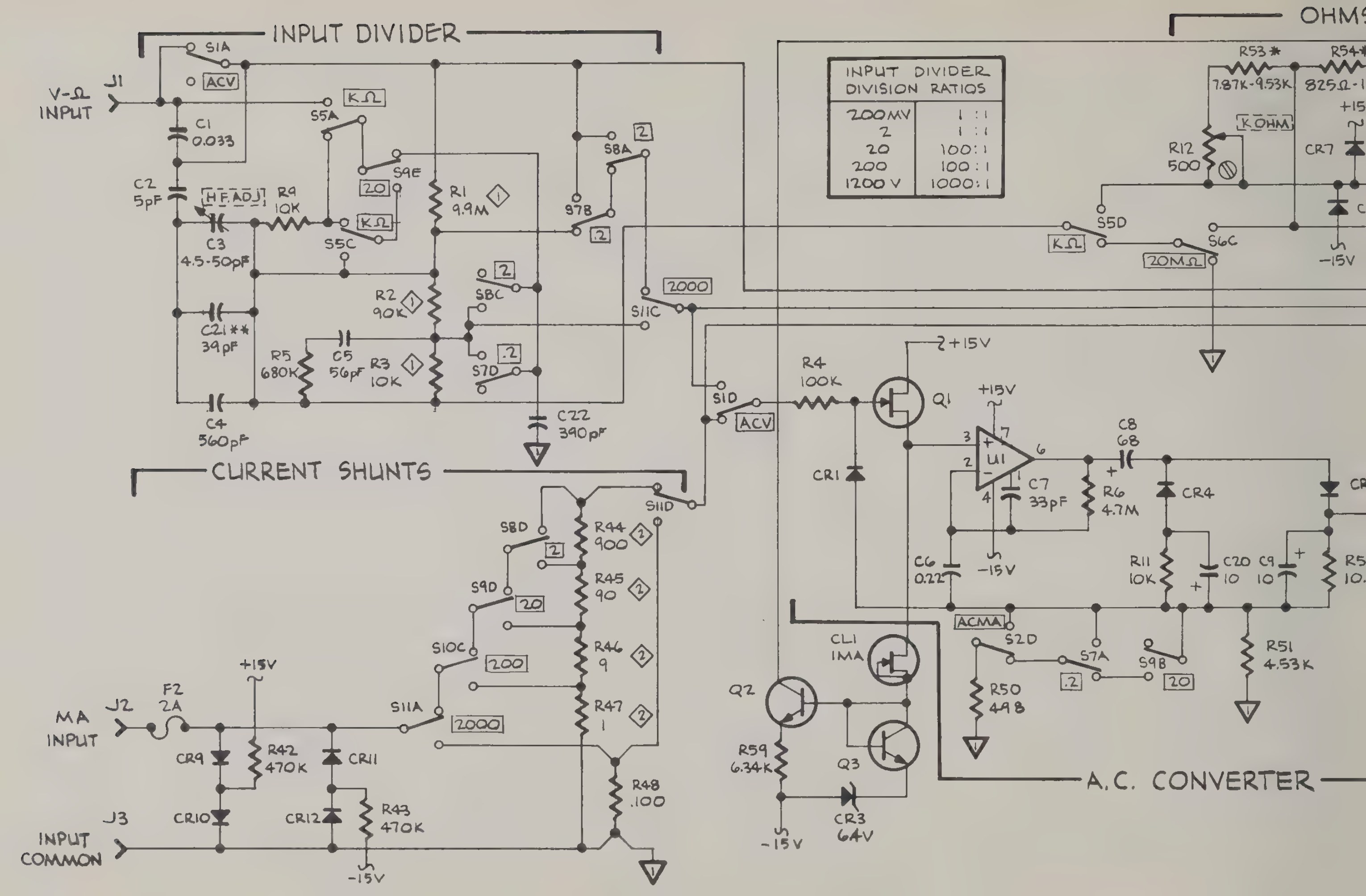
73445 Amperex Electronic Corp.
Hicksville, New York

73899 JFD Electronics Co.
Brooklyn, New York

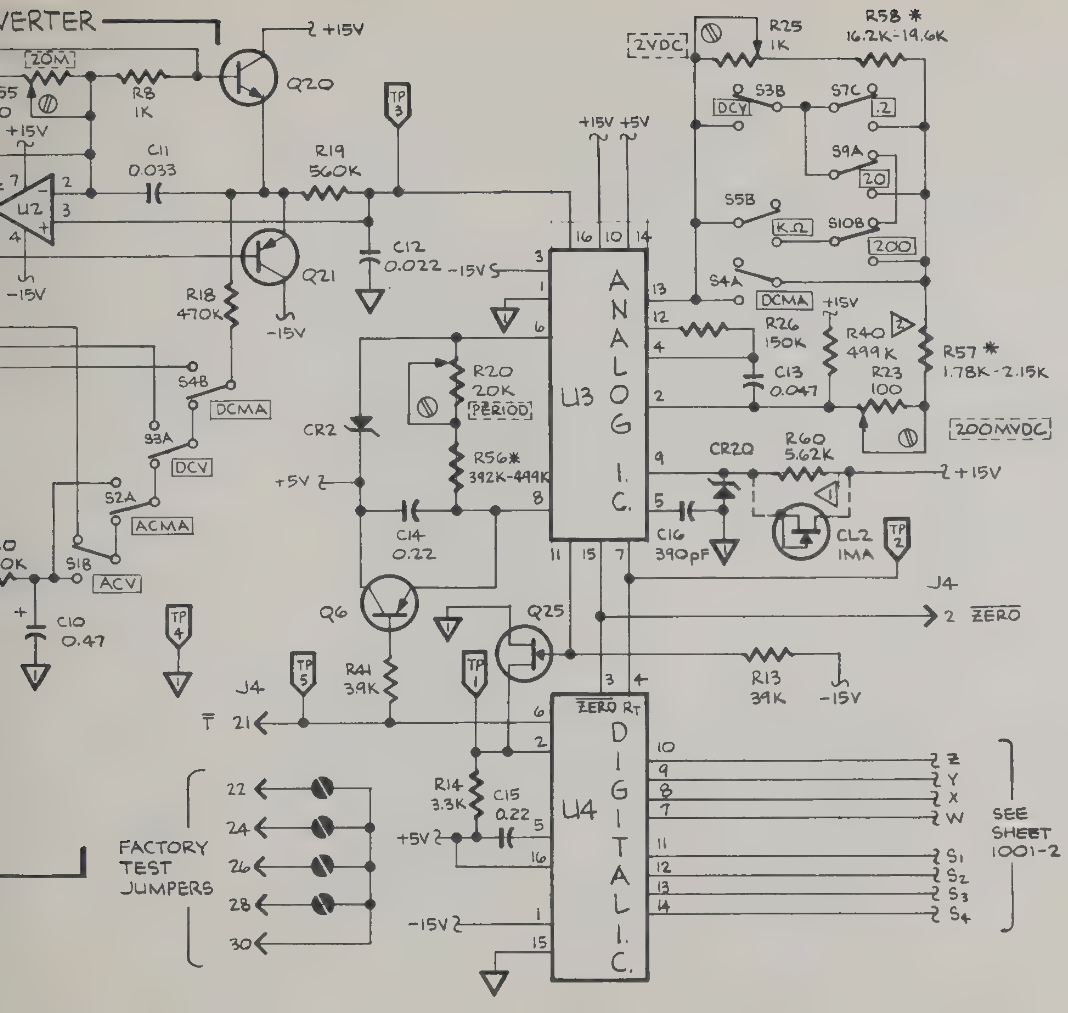
74970 Johnson, E.F., Co.
Waseca, Minnesota

89536 Fluke, John Mfg. Co., Inc.
Seattle, Washington

99392 STM Corp.
Oakland, California

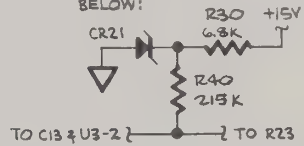


INPUT DIVIDER DIVISION RATIOS	
200MV	1 : 1
2	1 : 1
20	100 : 1
200	100 : 1
1200 V	1000 : 1



NOTES:

1. ALL CAPACITANCE IN MICROFARADS AND ALL RESISTANCE IN OHMS UNLESS OTHERWISE NOTED.
2. * FACTORY SELECTED PART(S).
3. ALL SWITCHES SHOWN IN NON-DEPRESSED POSITION.
4. SUPPLY COMMON.
   SIGNAL COMMON.
5. J4 - BOARD EDGE CONNECTOR.
6. PCB JUMPER
7. INTERNAL ADJUSTMENT
8. 1 RESISTOR USED IN LINE POWERED INSTRUMENTS. CURRENT REGULATOR USED IN BATTERY POWERED INSTRUMENTS.
9. ** COMPONENT MAY NOT BE INSTALLED.
10. FRONT PANEL DESIGNATION.
11. INTERNAL DESIGNATION.
12. 1, 2 MATCHED SETS.
13. 2 CONFIGURATION SHOWN FOR 8000A & 8000A-02. 8000A-01 AS SHOWN BELOW:

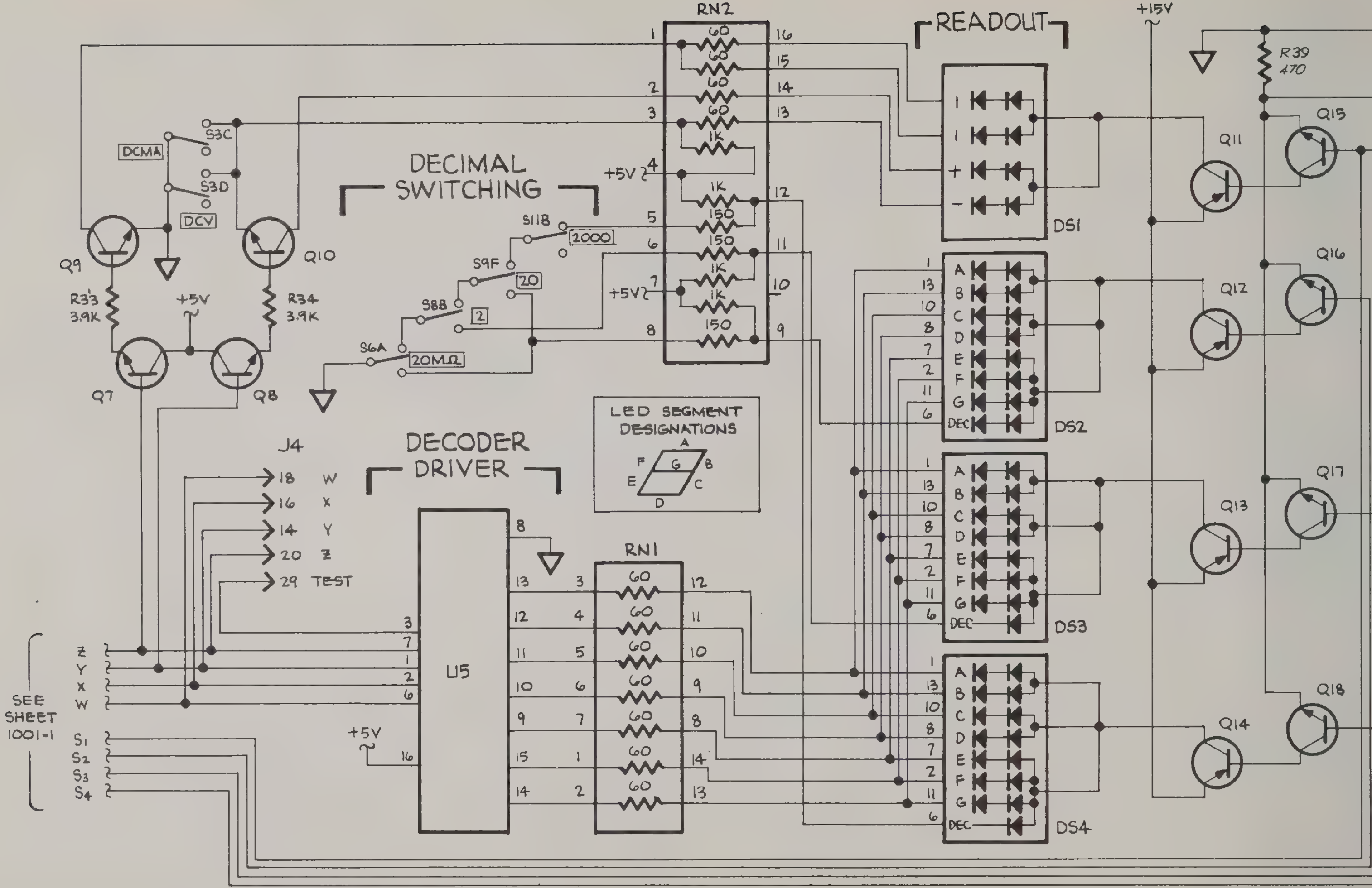


REV	DESCRIPTION
2	ADD: C23, R40, NOTE 13; CHG C6, C15
1	INITIAL ISSUE

8000A
DIGITAL MULTIMETER

8000A-1001

DATE	OCTOBER, 1972	SHEET 1 OF 2


RN2
READOUT
+15V
R39
470
DECIMAL
SWITCHING
DCMA
S3C
S3D
DCV
S11B
2000
S9F
20
S8B
2
S6A
20MΩ
+5V
Q9
Q10
Q7
Q8
R33
3.9K
R34
3.9K
DS1
DS2
DS3
DS4
Q11
Q12
Q13
Q14
Q15
Q16
Q17
Q18
LED SEGMENT
DESIGNATIONS
DEC
J4
18 W
16 X
14 Y
20 Z
29 TEST
DECODER
DRIVER
U5
RN1
SEE
SHEET
1001-1
Z
Y
X
W
S1
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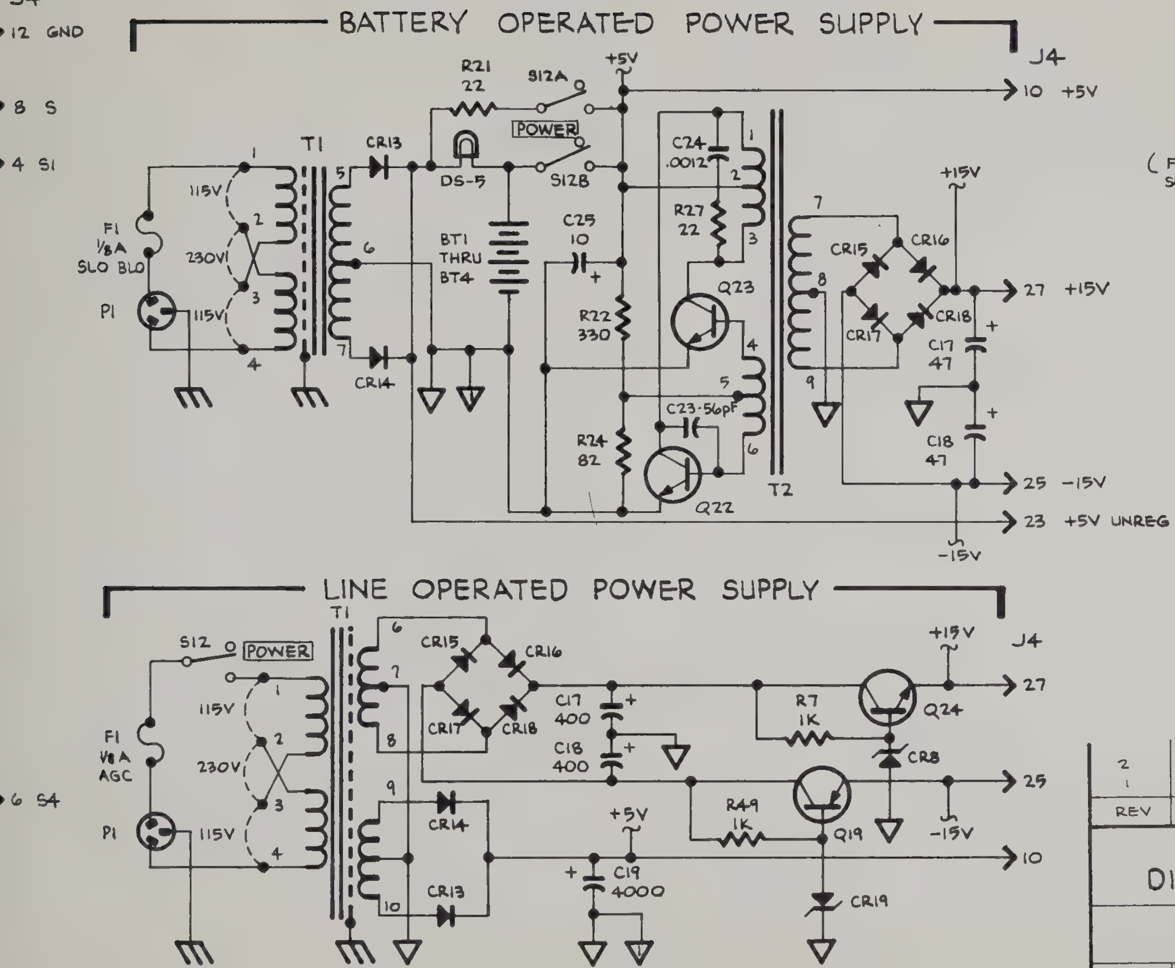
S4



(FOR ENGINEERING NOTES SEE SHEET 8000A-1001-1)

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